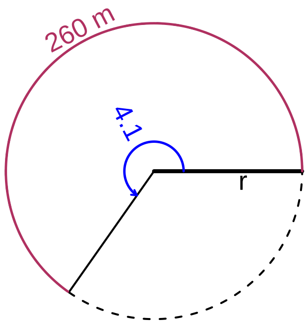
Name: Date:

Trig Final (Solution v0)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 260 meters. The angle measure is 4.1 radians. How long is the radius in meters?



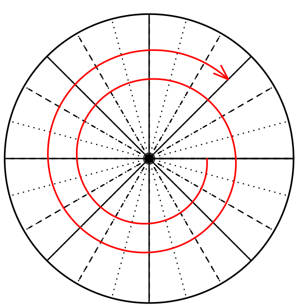
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 63.41$ meters.

Question 2

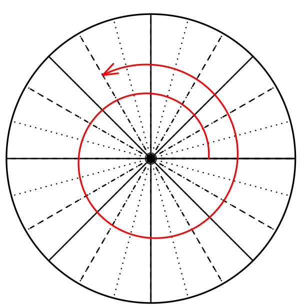
Consider angles $\frac{-15\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-15\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{-15\pi}{4}$



Find $\sin(-15\pi/4)$

Mark $\frac{8\pi}{3}$



Find $\cos(8\pi/3)$

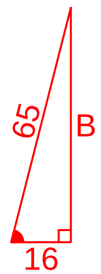
$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-16}{65}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

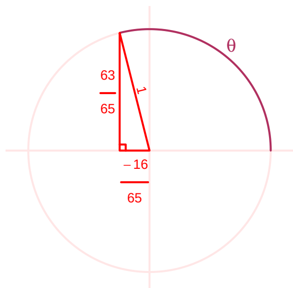
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 16^2}$$
$$B = 63$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{63}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.5 meters, a midline at $y = -5.79$ meters, and a frequency of 3.66 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.5\cos(2\pi 3.66t) - 5.79$$

or

$$y = -2.5\cos(7.32\pi t) - 5.79$$

or

$$y = -2.5\cos(23t) - 5.79$$

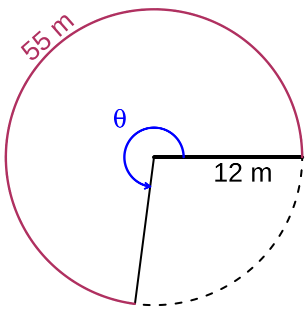
Name: Date:

Trig Final (Solution v1)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 55 meters. The radius is 12 meters. What is the angle measure in radians?



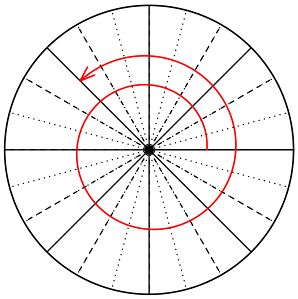
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.583$ radians.

Question 2

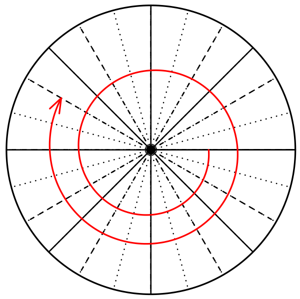
Consider angles $\frac{11\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{11\pi}{4}$



Find $\cos(11\pi/4)$

Mark $\frac{-19\pi}{6}$



Find $\sin(-19\pi/6)$

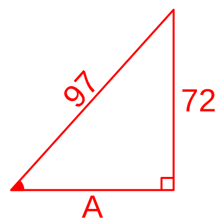
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-19\pi/6) = \frac{1}{2}$

Question 3

If $\sin(\theta) = \frac{-72}{97}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

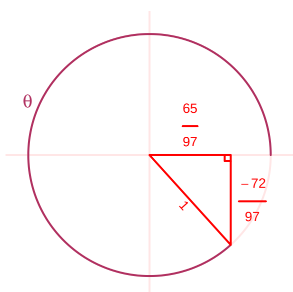
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 72^2 = 97^2$$
$$A = \sqrt{97^2 - 72^2}$$
$$A = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{65}{97}} = \frac{-72}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.28 meters, a midline at $y = 6.07$ meters, and a frequency of 8.42 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.28\cos(2\pi 8.42t) + 6.07$$

or

$$y = 3.28\cos(16.84\pi t) + 6.07$$

or

$$y = 3.28\cos(52.9t) + 6.07$$

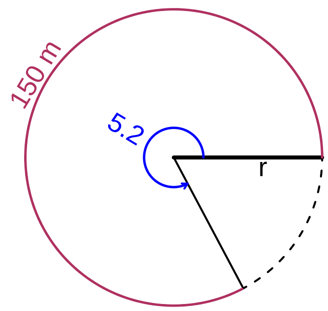
Name: Date:

Trig Final (Solution v2)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 150 meters. The angle measure is 5.2 radians. How long is the radius in meters?

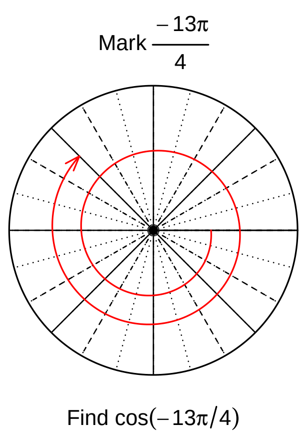


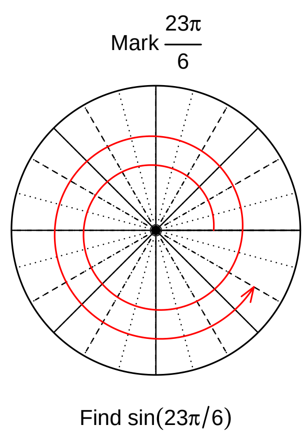
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 28.85$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{23\pi}{6}\right)$ by using a unit circle (provided separately).





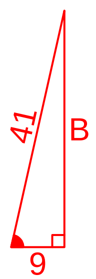
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(23\pi/6) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-9}{41}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

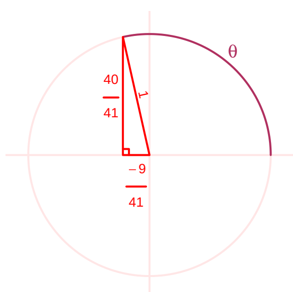
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$
$$B = \sqrt{41^2 - 9^2}$$
$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{40}{41}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.51 meters, a midline at $y = -2.23$ meters, and a frequency of 7.4 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.51\sin(2\pi 7.4t) - 2.23$$

or

$$y = -3.51\sin(14.8\pi t) - 2.23$$

or

$$y = -3.51\sin(46.5t) - 2.23$$

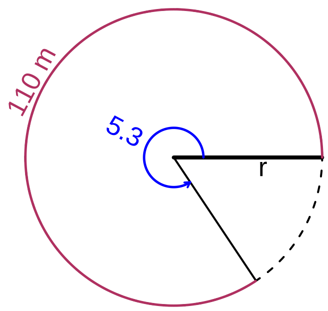
Name: Date:

Trig Final (Solution v3)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.3 radians. The arc length is 110 meters. How long is the radius in meters?

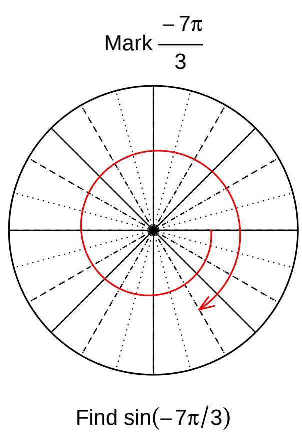


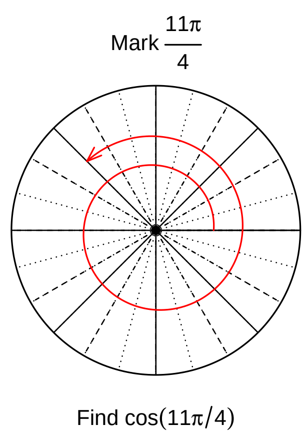
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 20.75$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-7\pi}{3}\right)$ and $\cos\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).





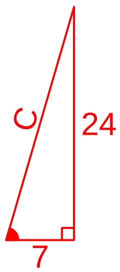
$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-24}{7}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

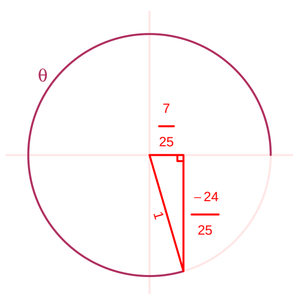
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{7}{25}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.57 Hz, an amplitude of 2.04 meters, and a midline at $y = 7.44$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.04\cos(2\pi 3.57t) + 7.44$$

or

$$y = -2.04\cos(7.14\pi t) + 7.44$$

or

$$y = -2.04\cos(22.43t) + 7.44$$

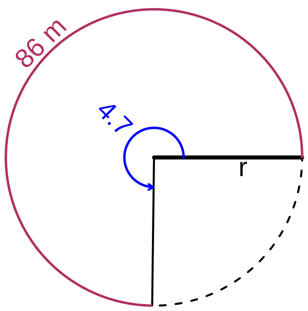
Name: Date:

Trig Final (Solution v4)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 86 meters. The angle measure is 4.7 radians. How long is the radius in meters?



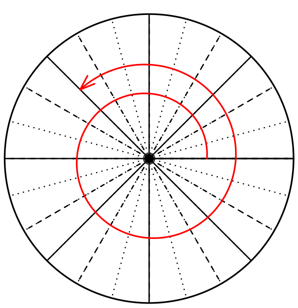
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 18.3$ meters.

Question 2

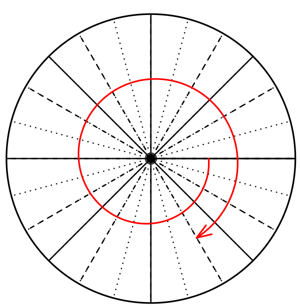
Consider angles $\frac{11\pi}{4}$ and $\frac{-7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-7\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{11\pi}{4}$



Find cos(11π/4)

Mark $\frac{-7\pi}{3}$



Find sin(−7π/3)

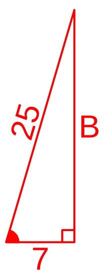
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-7}{25}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

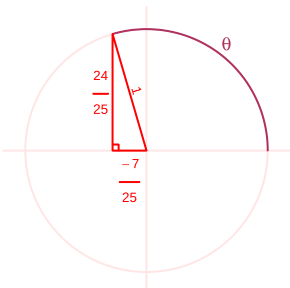
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + B^2 = 25^2$$
$$B = \sqrt{25^2 - 7^2}$$
$$B = 24$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{24}{25}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.35 meters, a frequency of 2.22 Hz, and a midline at $y = -8.66$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.35\sin(2\pi 2.22t) - 8.66$$

or

$$y = 3.35\sin(4.44\pi t) - 8.66$$

or

$$y = 3.35\sin(13.95t) - 8.66$$

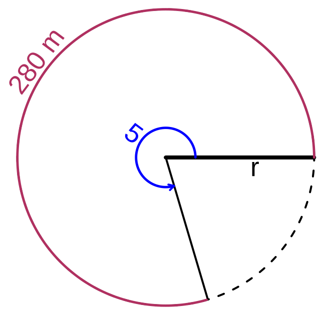
Name: Date:

Trig Final (Solution v5)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 280 meters. The angle measure is 5 radians. How long is the radius in meters?



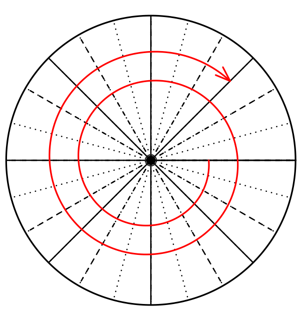
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 56$ meters.

Question 2

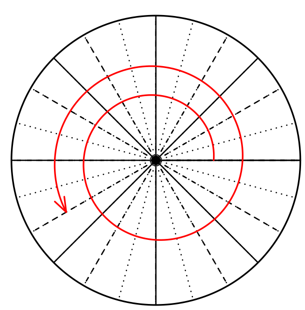
Consider angles $\frac{-15\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{-15\pi}{4}$



Find cos(−15π/4)

Mark $\frac{19\pi}{6}$



Find sin(19π/6)

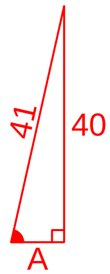
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(19\pi/6) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{-40}{41}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

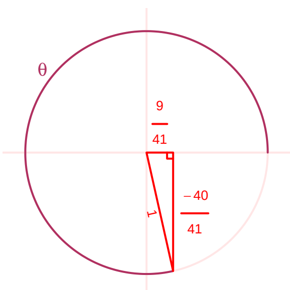
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 40^2 = 41^2$$
$$A = \sqrt{41^2 - 40^2}$$
$$A = 9$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{9}{41}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.21 Hz, an amplitude of 4.58 meters, and a midline at $y = -7.63$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.58\cos(2\pi 6.21t) - 7.63$$

or

$$y = -4.58\cos(12.42\pi t) - 7.63$$

or

$$y = -4.58\cos(39.02t) - 7.63$$

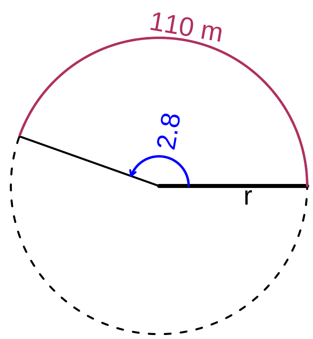
Name: Date:

Trig Final (Solution v6)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 110 meters. The angle measure is 2.8 radians. How long is the radius in meters?

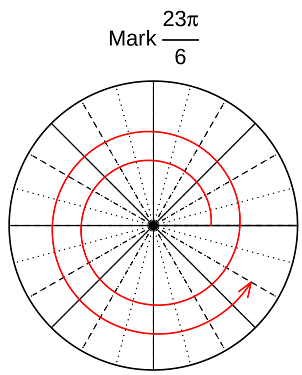


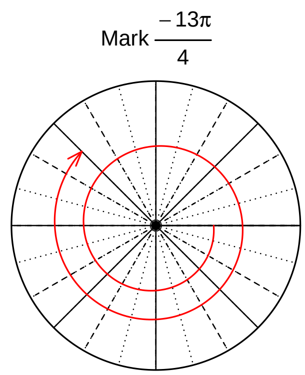
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 39.29$ meters.

Question 2

Consider angles $\frac{23\pi}{6}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{23\pi}{6}\right)$ and $\cos\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).





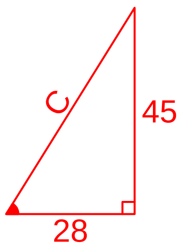
$\sin(23\pi/6) = \frac{-1}{2}$

$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-45}{28}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

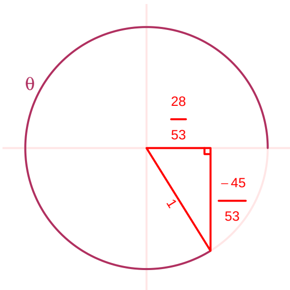
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + 45^2 = C^2$$
$$C = \sqrt{28^2 + 45^2}$$
$$C = 53$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{28}{53}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.85 Hz, an amplitude of 8.76 meters, and a midline at $y = 4.12$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.76\sin(2\pi 6.85t) + 4.12$$

or

$$y = -8.76\sin(13.7\pi t) + 4.12$$

or

$$y = -8.76\sin(43.04t) + 4.12$$

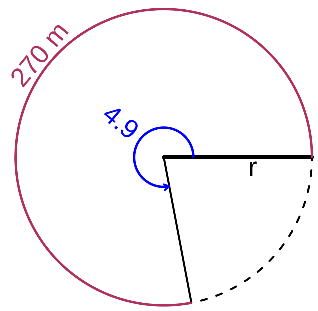
Name: Date:

Trig Final (Solution v7)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 270 meters. The angle measure is 4.9 radians. How long is the radius in meters?

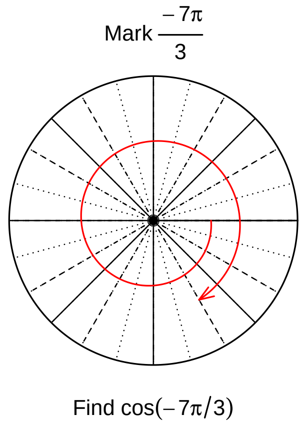


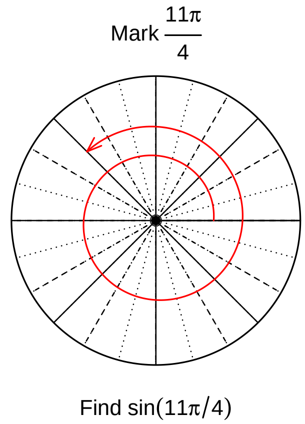
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 55.1$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-7\pi}{3}\right)$ and $\sin\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).





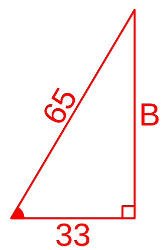
$\cos(-7\pi/3) = \frac{1}{2}$

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{33}{65}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

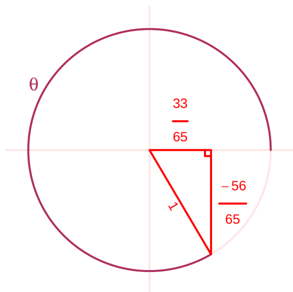
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$33^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 33^2}$$
$$B = 56$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-56}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.89 Hz, a midline at $y = -7$ meters, and an amplitude of 3.66 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.66\cos(2\pi 8.89t) - 7$$

or

$$y = -3.66\cos(17.78\pi t) - 7$$

or

$$y = -3.66\cos(55.86t) - 7$$

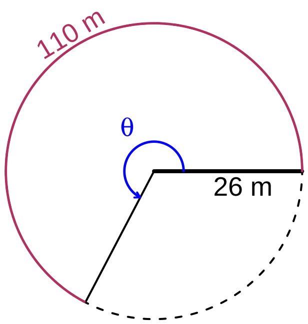
Name: Date:

Trig Final (Solution v8)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 110 meters. The radius is 26 meters. What is the angle measure in radians?

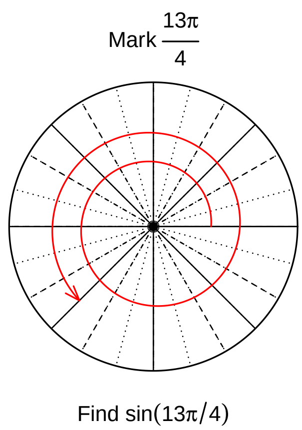


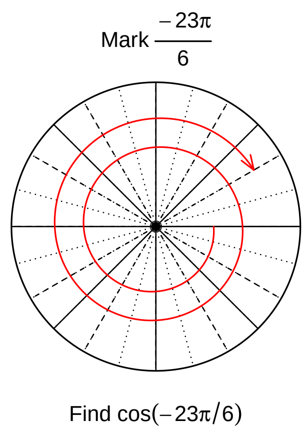
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.231$ radians.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).





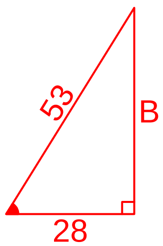
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-28}{53}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

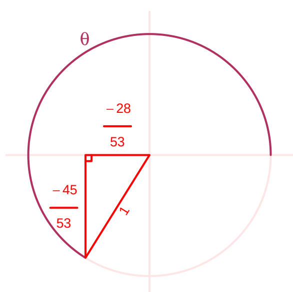
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + B^2 = 53^2$$
$$B = \sqrt{53^2 - 28^2}$$
$$B = 45$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-45}{53}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 4.97$ meters, an amplitude of 6.29 meters, and a frequency of 8.56 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.29\cos(2\pi 8.56t) + 4.97$$

or

$$y = 6.29\cos(17.12\pi t) + 4.97$$

or

$$y = 6.29\cos(53.78t) + 4.97$$

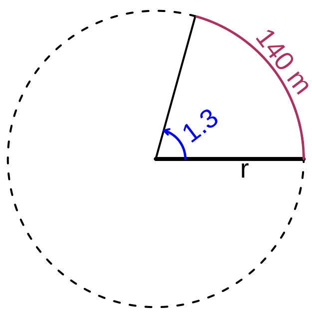
Name: Date:

Trig Final (Solution v9)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.3 radians. The arc length is 140 meters. How long is the radius in meters?

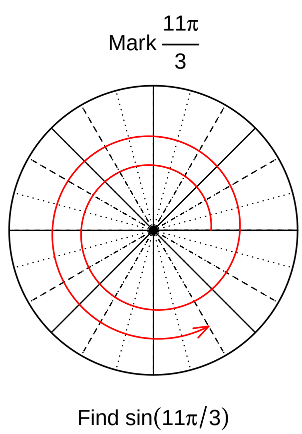


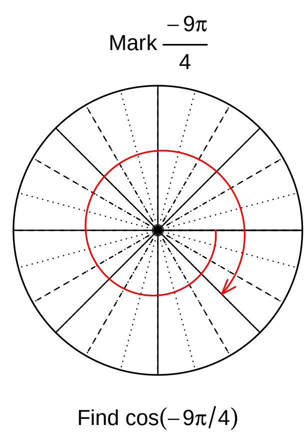
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 107.7$ meters.

Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{3}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).





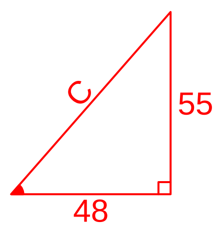
$\sin(11\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{55}{48}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

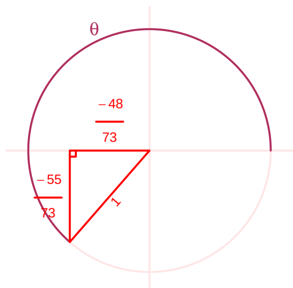
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + 55^2 = C^2$$
$$C = \sqrt{48^2 + 55^2}$$
$$C = 73$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-55}{73}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.02 Hz, a midline at $y = -7.23$ meters, and an amplitude of 5.24 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.24\cos(2\pi 3.02t) - 7.23$$

or

$$y = 5.24\cos(6.04\pi t) - 7.23$$

or

$$y = 5.24\cos(18.98t) - 7.23$$

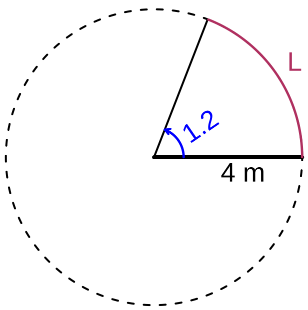
Name: Date:

Trig Final (Solution v10)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 4 meters. The angle measure is 1.2 radians. How long is the arc in meters?



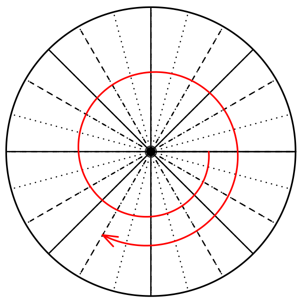
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 4.8$ meters.

Question 2

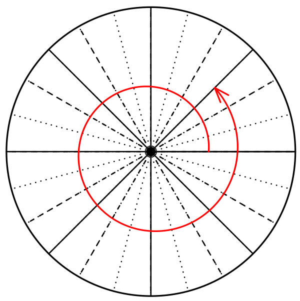
Consider angles $\frac{-8\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-8\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{-8\pi}{3}$



Find $\sin(-8\pi/3)$

Mark $\frac{9\pi}{4}$



Find $\cos(9\pi/4)$

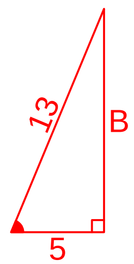
$\sin(-8\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-5}{13}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

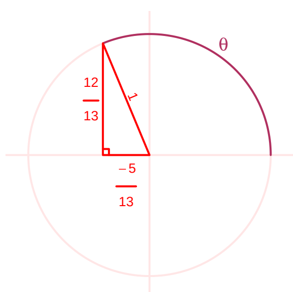
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$5^2 + B^2 = 13^2$$
$$B = \sqrt{13^2 - 5^2}$$
$$B = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{12}{13}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.29 Hz, an amplitude of 2.68 meters, and a midline at $y = 7.81$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.68\sin(2\pi 6.29t) + 7.81$$

or

$$y = 2.68\sin(12.58\pi t) + 7.81$$

or

$$y = 2.68\sin(39.52t) + 7.81$$

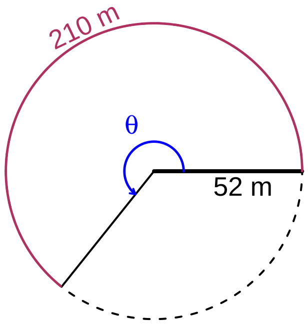
Name: Date:

Trig Final (Solution v11)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 52 meters. The arc length is 210 meters. What is the angle measure in radians?



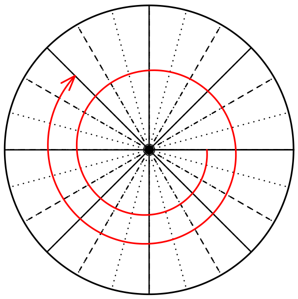
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.038$ radians.

Question 2

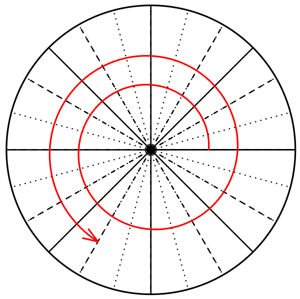
Consider angles $\frac{-13\pi}{4}$ and $\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{4}\right)$ and $\sin\left(\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{-13\pi}{4}$



Find cos(−13π/4)

Mark $\frac{10\pi}{3}$



Find sin(10π/3)

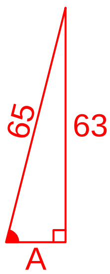
$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-63}{65}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

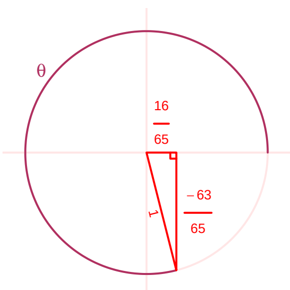
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 63^2 = 65^2$$
$$A = \sqrt{65^2 - 63^2}$$
$$A = 16$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{16}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.65 meters, a frequency of 4.69 Hz, and a midline at $y = 2.98$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.65\cos(2\pi 4.69t) + 2.98$$

or

$$y = -6.65\cos(9.38\pi t) + 2.98$$

or

$$y = -6.65\cos(29.47t) + 2.98$$

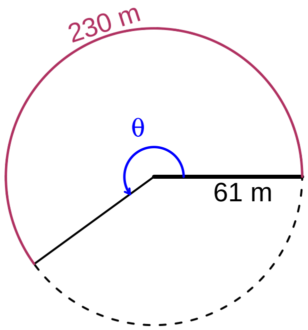
Name: Date:

Trig Final (Solution v12)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 230 meters. The radius is 61 meters. What is the angle measure in radians?

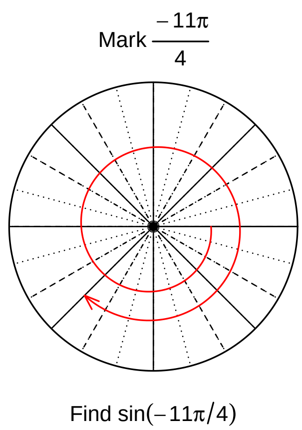


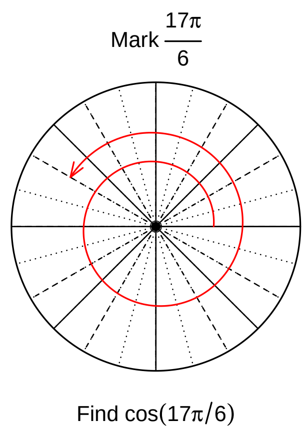
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 3.77$ radians.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{4}\right)$ and $\cos\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).





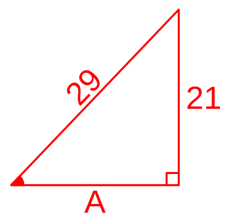
$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-21}{29}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

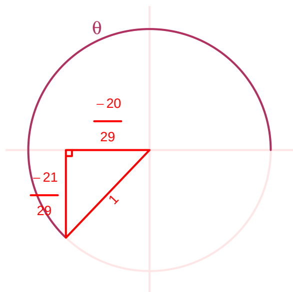
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 21^2 = 29^2$$
$$A = \sqrt{29^2 - 21^2}$$
$$A = 20$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-20}{29}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 4.97 meters, a midline at $y = -2.52$ meters, and a frequency of 6.94 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.97\cos(2\pi 6.94t) - 2.52$$

or

$$y = -4.97\cos(13.88\pi t) - 2.52$$

or

$$y = -4.97\cos(43.61t) - 2.52$$

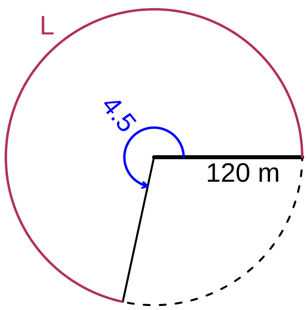
Name: Date:

Trig Final (Solution v13)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.5 radians. The radius is 120 meters. How long is the arc in meters?

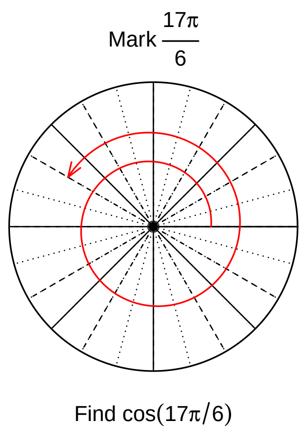


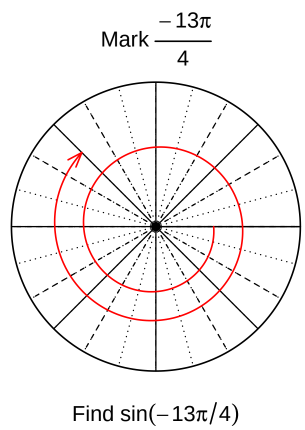
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 540$ meters.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{17\pi}{6}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).





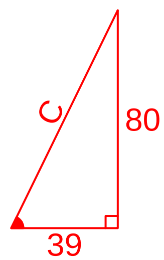
$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-80}{39}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

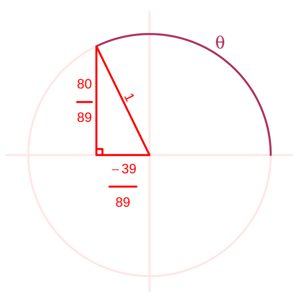
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + 80^2 = C^2$$
$$C = \sqrt{39^2 + 80^2}$$
$$C = 89$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{80}{89}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.7 meters, a frequency of 8.44 Hz, and a midline at $y = -3.53$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.7\sin(2\pi 8.44t) - 3.53$$

or

$$y = -6.7\sin(16.88\pi t) - 3.53$$

or

$$y = -6.7\sin(53.03t) - 3.53$$

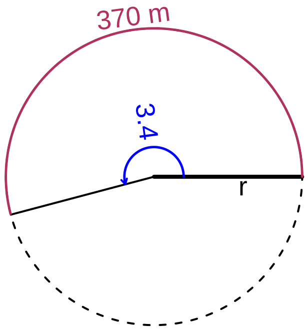
Name: Date:

Trig Final (Solution v14)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.4 radians. The arc length is 370 meters. How long is the radius in meters?

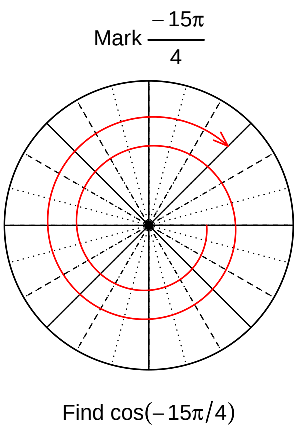


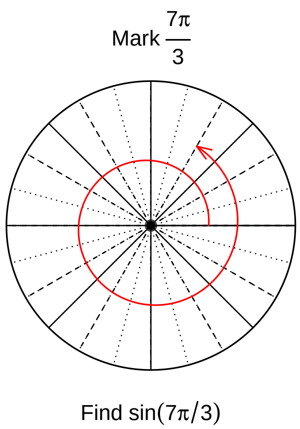
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 108.8$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{7\pi}{3}\right)$ by using a unit circle (provided separately).





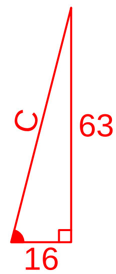
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{63}{16}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

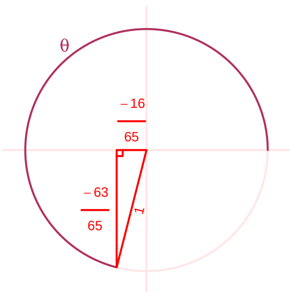
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + 63^2 = C^2$$
$$C = \sqrt{16^2 + 63^2}$$
$$C = 65$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-16}{65}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 3.67$ meters, a frequency of 2.6 Hz, and an amplitude of 8.89 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.89\sin(2\pi 2.6t) + 3.67$$

or

$$y = 8.89\sin(5.2\pi t) + 3.67$$

or

$$y = 8.89\sin(16.34t) + 3.67$$

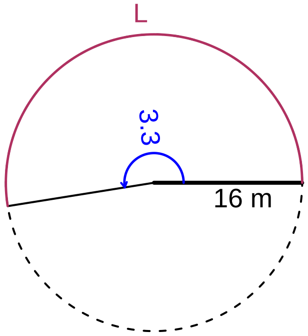
Name: Date:

Trig Final (Solution v15)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.3 radians. The radius is 16 meters. How long is the arc in meters?

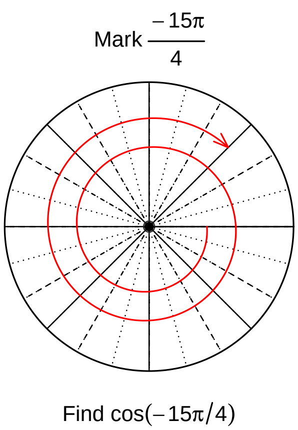


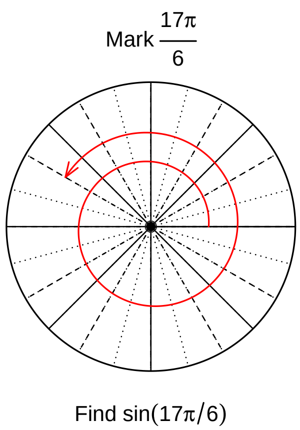
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 52.8$ meters.

Question 2

Consider angles $\frac{-15\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).





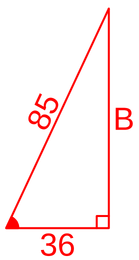
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(17\pi/6) = \frac{1}{2}$

Question 3

If $\cos(\theta) = \frac{-36}{85}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

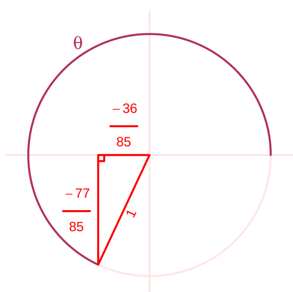
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-77}{85}}{\frac{-36}{85}} = \frac{77}{36}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -2.65$ meters, a frequency of 6.9 Hz, and an amplitude of 4.56 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.56\cos(2\pi 6.9t) - 2.65$$

or

$$y = -4.56\cos(13.8\pi t) - 2.65$$

or

$$y = -4.56\cos(43.35t) - 2.65$$

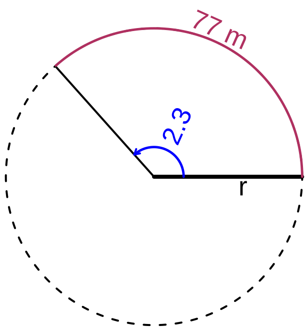
Name: Date:

Trig Final (Solution v16)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 77 meters. The angle measure is 2.3 radians. How long is the radius in meters?

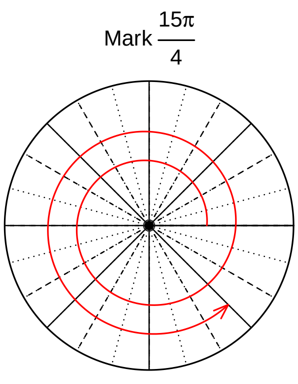


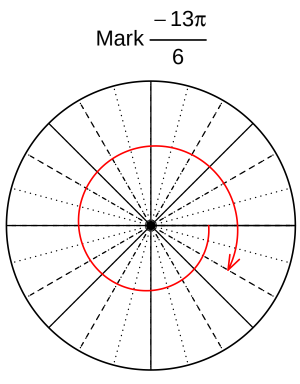
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 33.48$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).





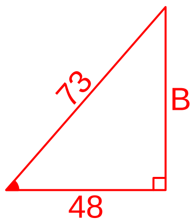
$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-13\pi/6) = \frac{-1}{2}$

Question 3

If $\cos(\theta) = \frac{-48}{73}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

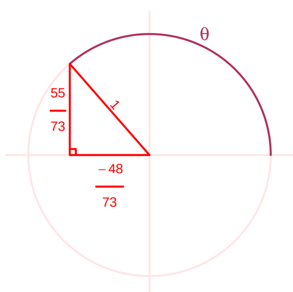
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + B^2 = 73^2$$
$$B = \sqrt{73^2 - 48^2}$$
$$B = 55$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{55}{73}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 7.4 Hz, an amplitude of 3.09 meters, and a midline at $y = -4.55$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.09\sin(2\pi 7.4t) - 4.55$$

or

$$y = -3.09\sin(14.8\pi t) - 4.55$$

or

$$y = -3.09\sin(46.5t) - 4.55$$

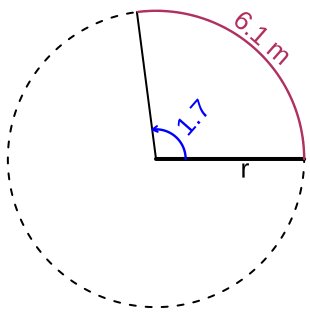
Name: Date:

Trig Final (Solution v17)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 6.1 meters. The angle measure is 1.7 radians. How long is the radius in meters?

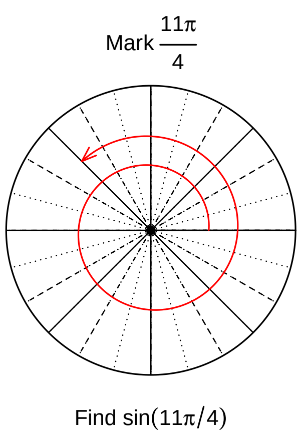


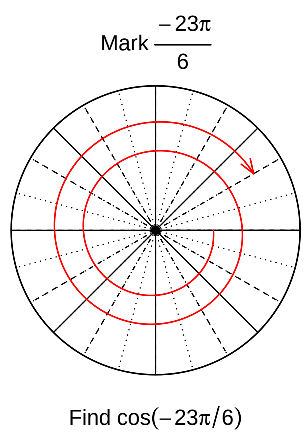
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 3.588$ meters.

Question 2

Consider angles $\frac{11\pi}{4}$ and $\frac{-23\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{4}\right)$ and $\cos\left(\frac{-23\pi}{6}\right)$ by using a unit circle (provided separately).





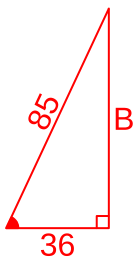
$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-23\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-36}{85}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

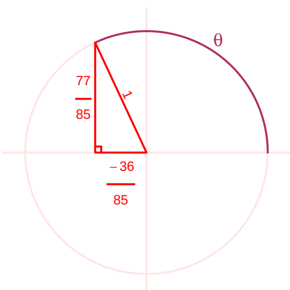
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{77}{85}}{\frac{-36}{85}} = \frac{-77}{36}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.95$ meters, a frequency of 6.77 Hz, and an amplitude of 4.3 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.3\sin(2\pi 6.77t) - 7.95$$

or

$$y = 4.3\sin(13.54\pi t) - 7.95$$

or

$$y = 4.3\sin(42.54t) - 7.95$$

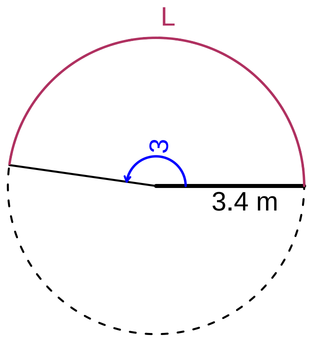
Name: Date:

Trig Final (Solution v18)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3 radians. The radius is 3.4 meters. How long is the arc in meters?



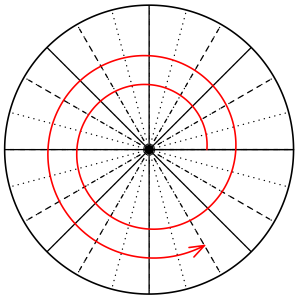
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 10.2$ meters.

Question 2

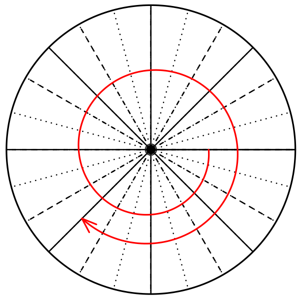
Consider angles $\frac{11\pi}{3}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{3}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{11\pi}{3}$



Find $\sin(11\pi/3)$

Mark $\frac{-11\pi}{4}$



Find $\cos(-11\pi/4)$

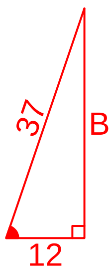
$\sin(11\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-12}{37}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

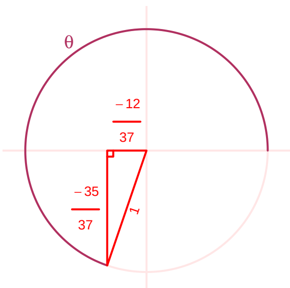
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + B^2 = 37^2$$
$$B = \sqrt{37^2 - 12^2}$$
$$B = 35$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-35}{37}}{\frac{-12}{37}} = \frac{35}{12}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -3.95$ meters, a frequency of 5.24 Hz, and an amplitude of 2.81 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.81 \sin(2\pi 5.24t) - 3.95$$

or

$$y = 2.81 \sin(10.48\pi t) - 3.95$$

or

$$y = 2.81 \sin(32.92t) - 3.95$$

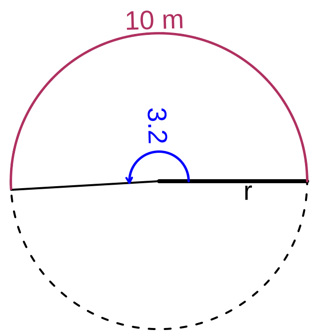
Name: Date:

Trig Final (Solution v19)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.2 radians. The arc length is 10 meters. How long is the radius in meters?



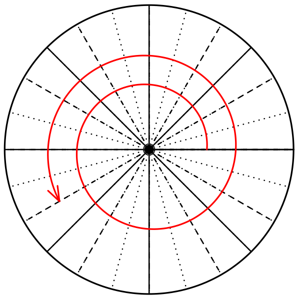
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 3.125$ meters.

Question 2

Consider angles $\frac{19\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{19\pi}{6}\right)$ and $\sin\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).

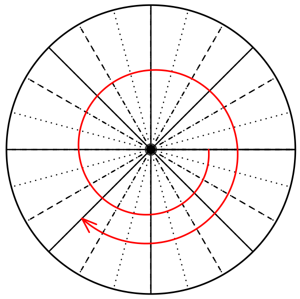
Mark $\frac{19\pi}{6}$



Find $\cos(19\pi/6)$

$\cos(19\pi/6) = \frac{-\sqrt{3}}{2}$

Mark $\frac{-11\pi}{4}$



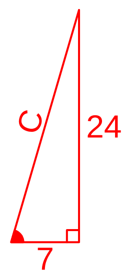
Find $\sin(-11\pi/4)$

$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-24}{7}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

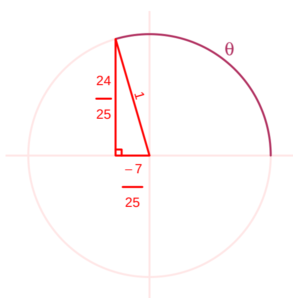
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-7}{25}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.72 Hz, an amplitude of 5.32 meters, and a midline at $y = 2.53$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.32\sin(2\pi 3.72t) + 2.53$$

or

$$y = 5.32\sin(7.44\pi t) + 2.53$$

or

$$y = 5.32\sin(23.37t) + 2.53$$

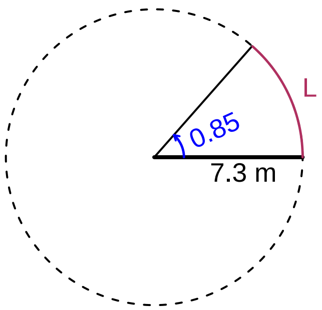
Name: Date:

Trig Final (Solution v20)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 7.3 meters. The angle measure is 0.85 radians. How long is the arc in meters?



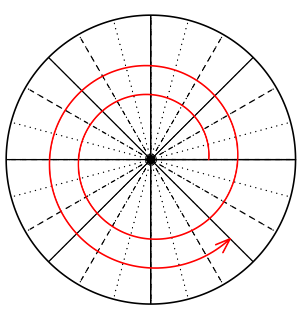
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 6.205$ meters.

Question 2

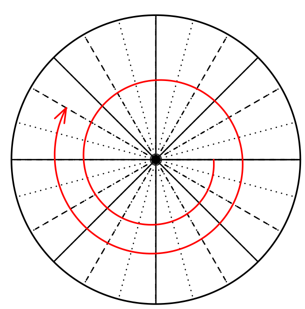
Consider angles $\frac{15\pi}{4}$ and $\frac{-19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{15\pi}{4}\right)$ and $\cos\left(\frac{-19\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{15\pi}{4}$



Find $\sin(15\pi/4)$

Mark $\frac{-19\pi}{6}$



Find $\cos(-19\pi/6)$

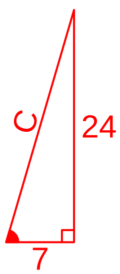
$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-19\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{-24}{7}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

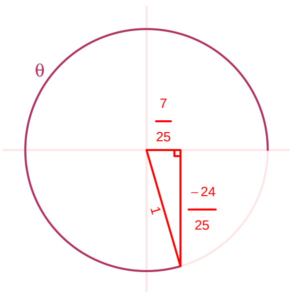
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$7^2 + 24^2 = C^2$$
$$C = \sqrt{7^2 + 24^2}$$
$$C = 25$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-24}{25}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.31$ meters, a frequency of 5.32 Hz, and an amplitude of 2.57 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.57\cos(2\pi 5.32t) + 7.31$$

or

$$y = 2.57\cos(10.64\pi t) + 7.31$$

or

$$y = 2.57\cos(33.43t) + 7.31$$

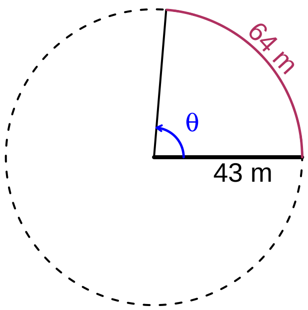
Name: Date:

Trig Final (Solution v21)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 64 meters. The radius is 43 meters. What is the angle measure in radians?



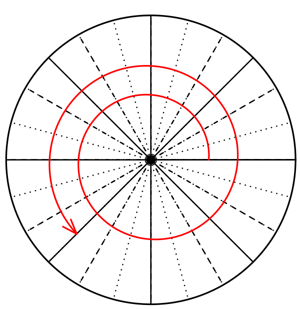
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 1.488$ radians.

Question 2

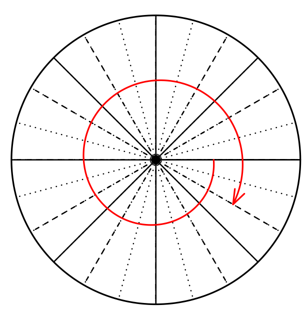
Consider angles $\frac{13\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{13\pi}{4}$



Find sin(13π/4)

Mark $\frac{-13\pi}{6}$



Find cos(−13π/6)

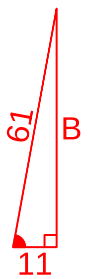
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{11}{61}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

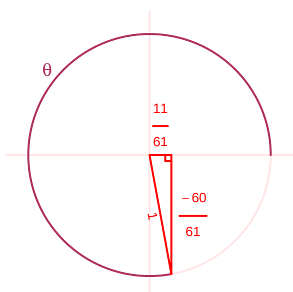
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$11^2 + B^2 = 61^2$$
$$B = \sqrt{61^2 - 11^2}$$
$$B = 60$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-60}{61}}{\frac{11}{61}} = \frac{-60}{11}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.02 Hz, a midline at $y = 3.32$ meters, and an amplitude of 8.4 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.4\sin(2\pi 6.02t) + 3.32$$

or

$$y = -8.4\sin(12.04\pi t) + 3.32$$

or

$$y = -8.4\sin(37.82t) + 3.32$$

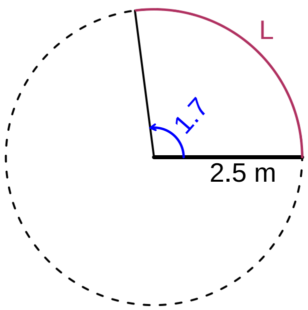
Name: Date:

Trig Final (Solution v22)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.5 meters. The angle measure is 1.7 radians. How long is the arc in meters?



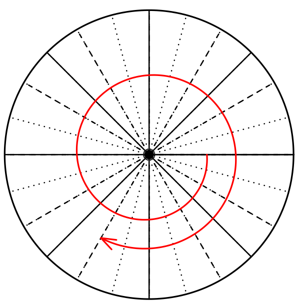
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 4.25$ meters.

Question 2

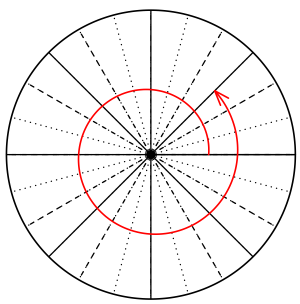
Consider angles $\frac{-8\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-8\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{-8\pi}{3}$



Find $\sin(-8\pi/3)$

Mark $\frac{9\pi}{4}$



Find $\cos(9\pi/4)$

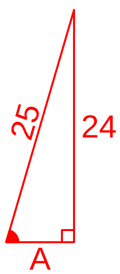
$\sin(-8\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{24}{25}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

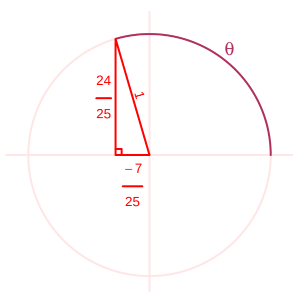
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 24^2 = 25^2$$
$$A = \sqrt{25^2 - 24^2}$$
$$A = 7$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-7}{25}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.94 meters, a frequency of 2.15 Hz, and a midline at $y = 3.69$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.94\cos(2\pi 2.15t) + 3.69$$

or

$$y = 8.94\cos(4.3\pi t) + 3.69$$

or

$$y = 8.94\cos(13.51t) + 3.69$$

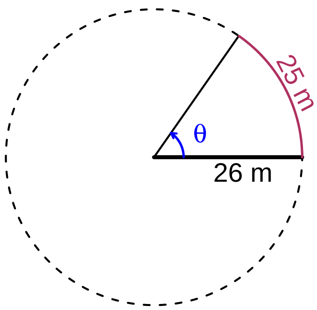
Name: Date:

Trig Final (Solution v23)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 26 meters. The arc length is 25 meters. What is the angle measure in radians?

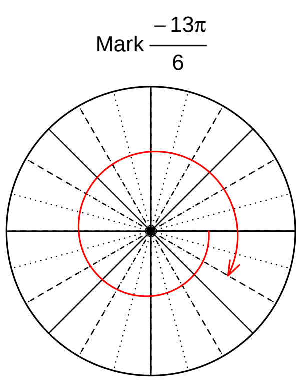


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

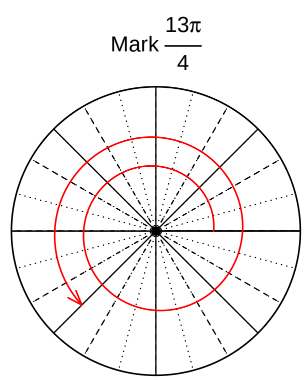
$\theta = 0.9615$ radians.

Question 2

Consider angles $\frac{-13\pi}{6}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{6}\right)$ and $\cos\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/6)$



Find $\cos(13\pi/4)$

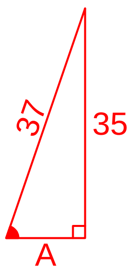
$\sin(-13\pi/6) = \frac{-1}{2}$

$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-35}{37}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

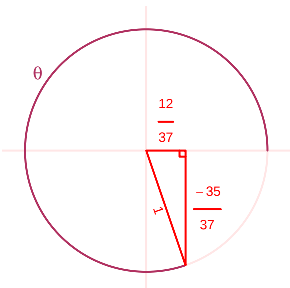
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 35^2 = 37^2$$
$$A = \sqrt{37^2 - 35^2}$$
$$A = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{12}{37}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.87 Hz, a midline at $y = 7.14$ meters, and an amplitude of 3.4 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.4 \sin(2\pi 4.87t) + 7.14$$

or

$$y = 3.4 \sin(9.74\pi t) + 7.14$$

or

$$y = 3.4 \sin(30.6t) + 7.14$$

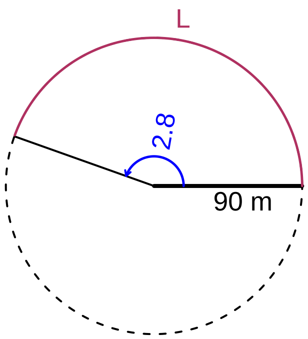
Name: Date:

Trig Final (Solution v24)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 90 meters. The angle measure is 2.8 radians. How long is the arc in meters?

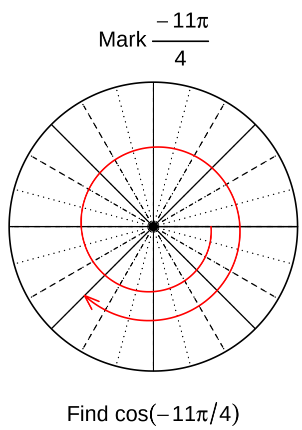


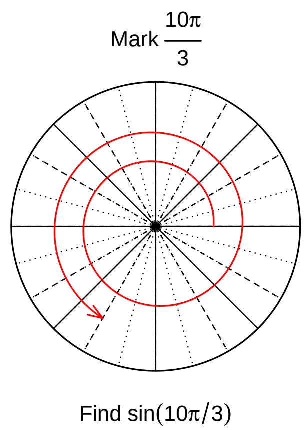
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 252$ meters.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{10\pi}{3}\right)$ by using a unit circle (provided separately).





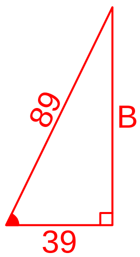
$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-39}{89}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

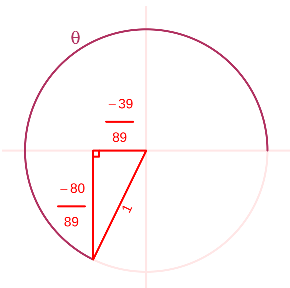
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + B^2 = 89^2$$
$$B = \sqrt{89^2 - 39^2}$$
$$B = 80$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-80}{89}}{\frac{-39}{89}} = \frac{80}{39}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 2.27 Hz, an amplitude of 8.62 meters, and a midline at $y = -3.47$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.62\cos(2\pi 2.27t) - 3.47$$

or

$$y = -8.62\cos(4.54\pi t) - 3.47$$

or

$$y = -8.62\cos(14.26t) - 3.47$$

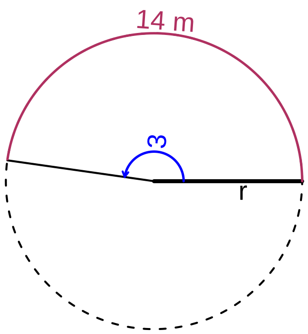
Name: Date:

Trig Final (Solution v25)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 14 meters. The angle measure is 3 radians. How long is the radius in meters?

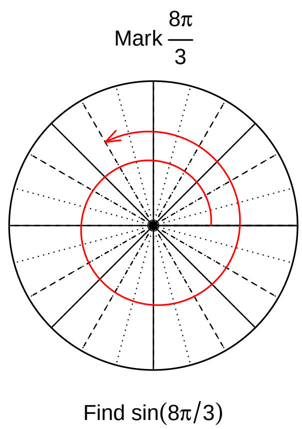


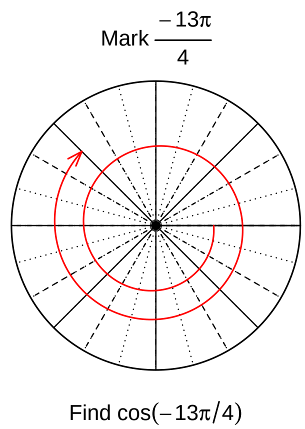
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 4.667$ meters.

Question 2

Consider angles $\frac{8\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{8\pi}{3}\right)$ and $\cos\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).





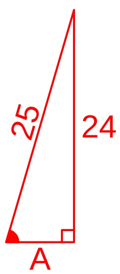
$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(-13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-24}{25}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

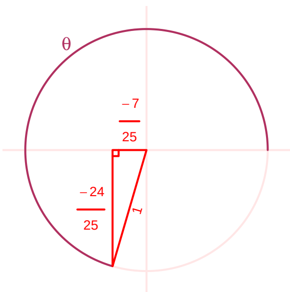
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 24^2 = 25^2$$
$$A = \sqrt{25^2 - 24^2}$$
$$A = 7$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-7}{25}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.47 Hz, a midline at $y = 7.23$ meters, and an amplitude of 2.32 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.32 \sin(2\pi 4.47t) + 7.23$$

or

$$y = 2.32 \sin(8.94\pi t) + 7.23$$

or

$$y = 2.32 \sin(28.09t) + 7.23$$

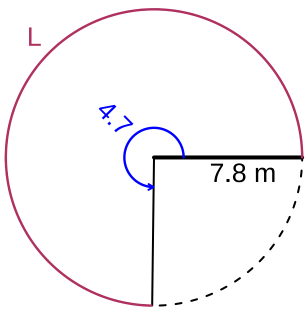
Name: Date:

Trig Final (Solution v26)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 7.8 meters. The angle measure is 4.7 radians. How long is the arc in meters?



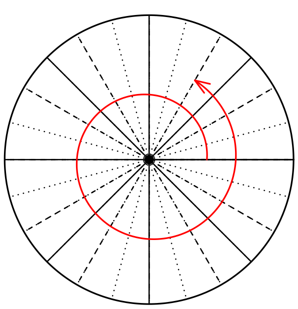
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 36.66$ meters.

Question 2

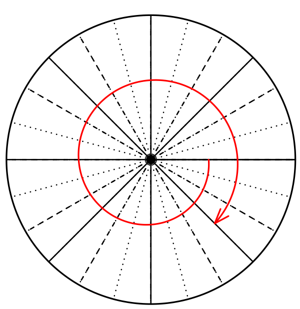
Consider angles $\frac{7\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{7\pi}{3}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{7\pi}{3}$



Find $\sin(7\pi/3)$

Mark $\frac{-9\pi}{4}$



Find $\cos(-9\pi/4)$

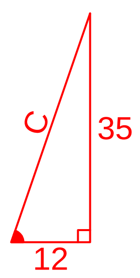
$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-35}{12}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

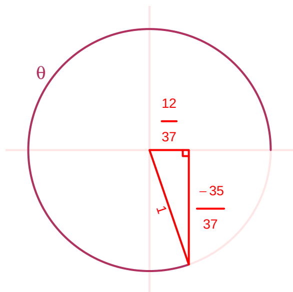
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + 35^2 = C^2$$
$$C = \sqrt{12^2 + 35^2}$$
$$C = 37$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{12}{37}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.63 Hz, an amplitude of 8.35 meters, and a midline at $y = 6.66$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.35 \sin(2\pi 3.63t) + 6.66$$

or

$$y = 8.35 \sin(7.26\pi t) + 6.66$$

or

$$y = 8.35 \sin(22.81t) + 6.66$$

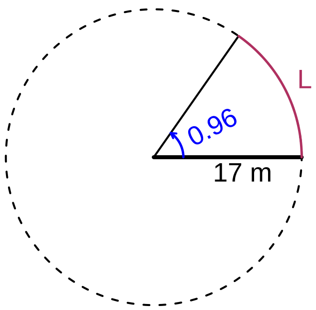
Name: Date:

Trig Final (Solution v27)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 0.96 radians. The radius is 17 meters. How long is the arc in meters?



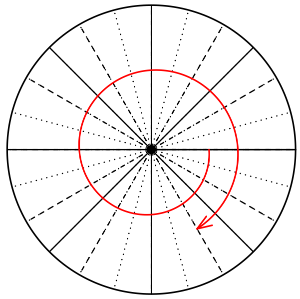
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 16.32$ meters.

Question 2

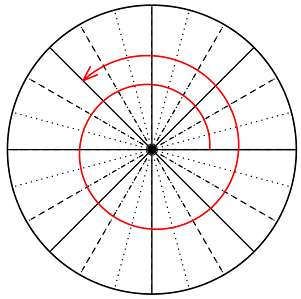
Consider angles $\frac{-7\pi}{3}$ and $\frac{11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-7\pi}{3}\right)$ and $\sin\left(\frac{11\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{-7\pi}{3}$



Find $\cos(-7\pi/3)$

Mark $\frac{11\pi}{4}$



Find $\sin(11\pi/4)$

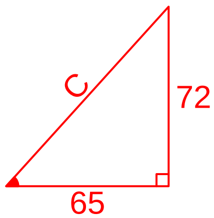
$\cos(-7\pi/3) = \frac{1}{2}$

$\sin(11\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{72}{65}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

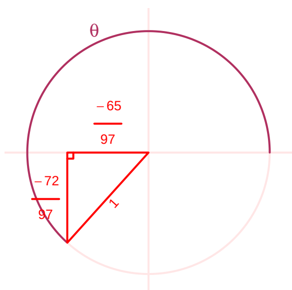
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + 72^2 = C^2$$
$$C = \sqrt{65^2 + 72^2}$$
$$C = 97$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-65}{97}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 3.23 meters, a frequency of 4.39 Hz, and a midline at $y = -7.11$ meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.23\cos(2\pi 4.39t) - 7.11$$

or

$$y = -3.23\cos(8.78\pi t) - 7.11$$

or

$$y = -3.23\cos(27.58t) - 7.11$$

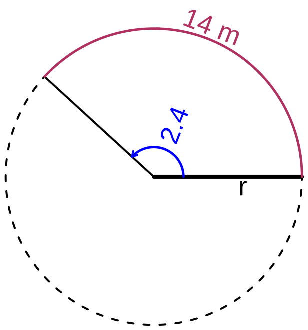
Name: Date:

Trig Final (Solution v28)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.4 radians. The arc length is 14 meters. How long is the radius in meters?

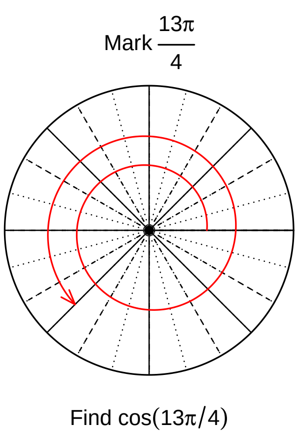


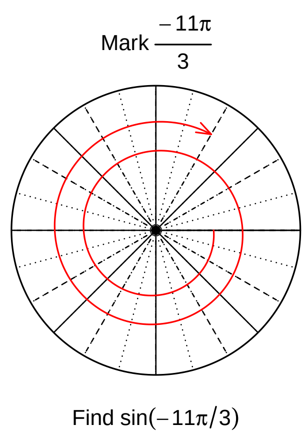
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 5.833$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{13\pi}{4}\right)$ and $\sin\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).





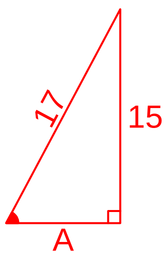
$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{15}{17}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

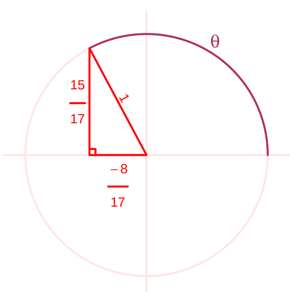
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 15^2 = 17^2$$
$$A = \sqrt{17^2 - 15^2}$$
$$A = 8$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-8}{17}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.13$ meters, an amplitude of 2.52 meters, and a frequency of 7.5 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -2.52 \sin(2\pi 7.5t) - 5.13$$

or

$$y = -2.52 \sin(15\pi t) - 5.13$$

or

$$y = -2.52 \sin(47.12t) - 5.13$$

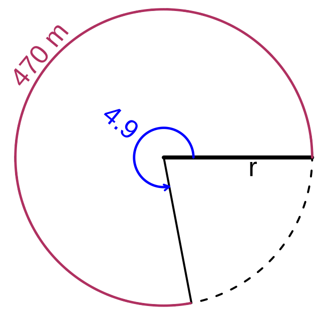
Name: Date:

Trig Final (Solution v29)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.9 radians. The arc length is 470 meters. How long is the radius in meters?



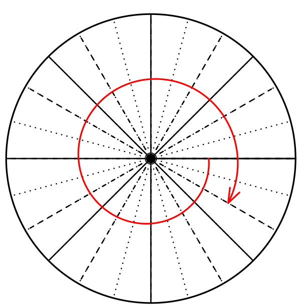
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 95.92$ meters.

Question 2

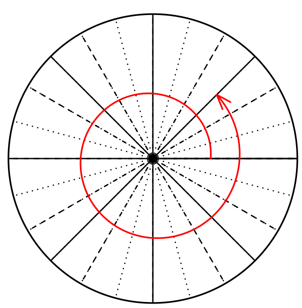
Consider angles $\frac{-13\pi}{6}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-13\pi}{6}\right)$ and $\sin\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{-13\pi}{6}$



Find cos(−13π/6)

Mark $\frac{9\pi}{4}$



Find sin(9π/4)

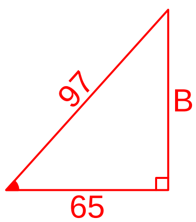
$\cos(-13\pi/6) = \frac{\sqrt{3}}{2}$

$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-65}{97}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

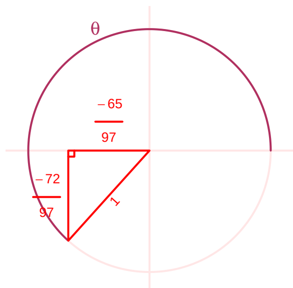
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + B^2 = 97^2$$
$$B = \sqrt{97^2 - 65^2}$$
$$B = 72$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{-65}{97}} = \frac{72}{65}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.08 meters, a midline at $y = 4.72$ meters, and a frequency of 8.41 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.08\cos(2\pi 8.41t) + 4.72$$

or

$$y = 2.08\cos(16.82\pi t) + 4.72$$

or

$$y = 2.08\cos(52.84t) + 4.72$$

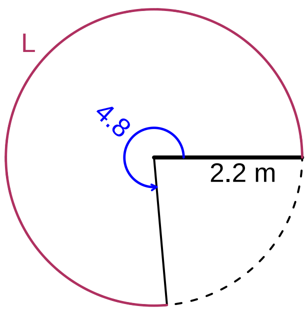
Name: Date:

Trig Final (Solution v30)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2.2 meters. The angle measure is 4.8 radians. How long is the arc in meters?



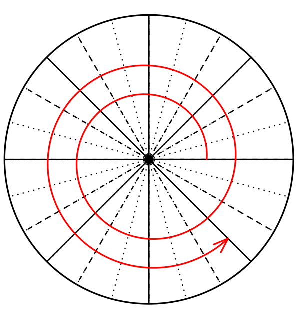
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 10.56$ meters.

Question 2

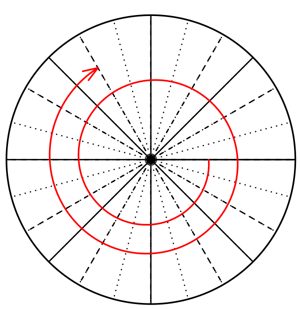
Consider angles $\frac{15\pi}{4}$ and $\frac{-10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(\frac{-10\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{15\pi}{4}$



Find cos(15π/4)

Mark $\frac{-10\pi}{3}$



Find sin(−10π/3)

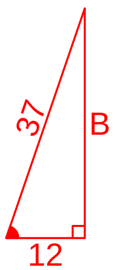
$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-10\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{12}{37}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

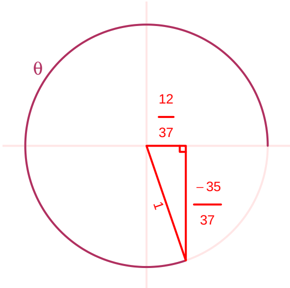
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + B^2 = 37^2$$
$$B = \sqrt{37^2 - 12^2}$$
$$B = 35$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-35}{37}}{\frac{12}{37}} = \frac{-35}{12}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.22$ meters, a frequency of 3.93 Hz, and an amplitude of 2.03 meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.03\cos(2\pi 3.93t) - 8.22$$

or

$$y = 2.03\cos(7.86\pi t) - 8.22$$

or

$$y = 2.03\cos(24.69t) - 8.22$$

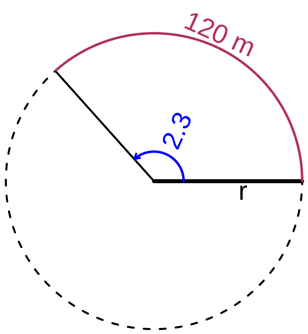
Name: Date:

Trig Final (Solution v31)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.3 radians. The arc length is 120 meters. How long is the radius in meters?

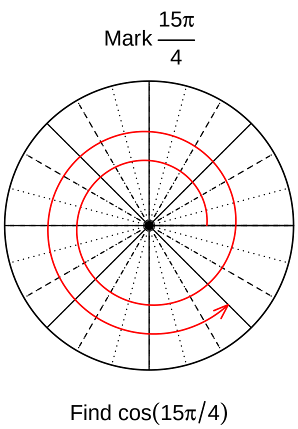


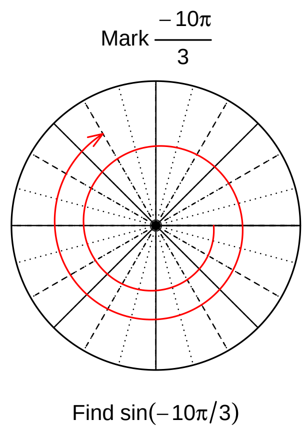
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 52.17$ meters.

Question 2

Consider angles $\frac{15\pi}{4}$ and $\frac{-10\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{15\pi}{4}\right)$ and $\sin\left(\frac{-10\pi}{3}\right)$ by using a unit circle (provided separately).





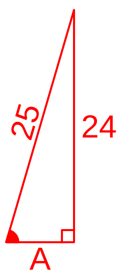
$\cos(15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-10\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\sin(\theta) = \frac{-24}{25}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

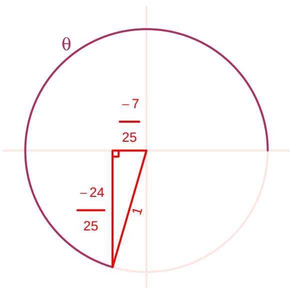
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 24^2 = 25^2$$
$$A = \sqrt{25^2 - 24^2}$$
$$A = 7$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-24}{25}}{\frac{-7}{25}} = \frac{24}{7}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.05 meters, a midline at $y = -7.75$ meters, and a frequency of 5.99 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.05\cos(2\pi 5.99t) - 7.75$$

or

$$y = 2.05\cos(11.98\pi t) - 7.75$$

or

$$y = 2.05\cos(37.64t) - 7.75$$

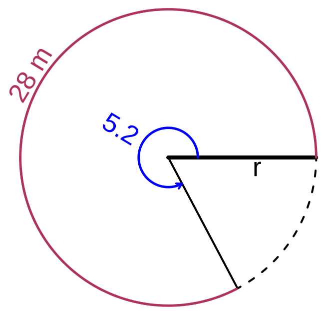
Name: Date:

Trig Final (Solution v32)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.2 radians. The arc length is 28 meters. How long is the radius in meters?



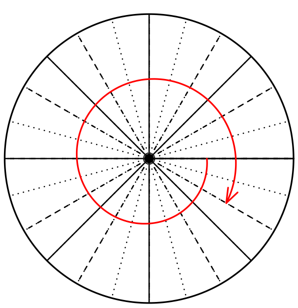
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 5.385$ meters.

Question 2

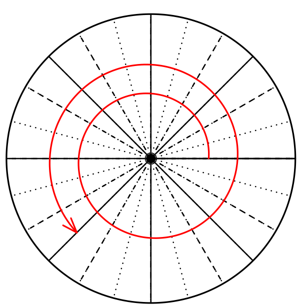
Consider angles $\frac{-13\pi}{6}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{6}\right)$ and $\cos\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{-13\pi}{6}$



Find sin(−13π/6)

Mark $\frac{13\pi}{4}$



Find cos(13π/4)

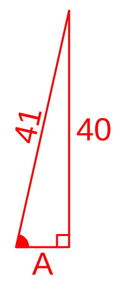
$\sin(-13\pi/6) = \frac{-1}{2}$

$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-40}{41}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

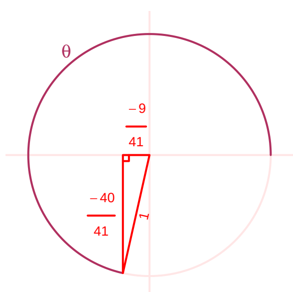
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 40^2 = 41^2$$
$$A = \sqrt{41^2 - 40^2}$$
$$A = 9$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-40}{41}}{\frac{-9}{41}} = \frac{40}{9}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 6.26 Hz, an amplitude of 5.1 meters, and a midline at $y = -3.3$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.1\sin(2\pi 6.26t) - 3.3$$

or

$$y = 5.1\sin(12.52\pi t) - 3.3$$

or

$$y = 5.1\sin(39.33t) - 3.3$$

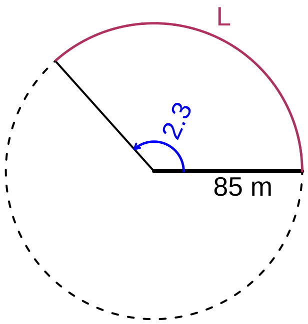
Name: Date:

Trig Final (Solution v33)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 85 meters. The angle measure is 2.3 radians. How long is the arc in meters?



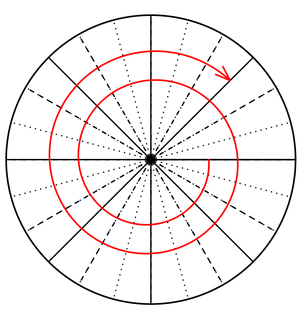
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 195.5$ meters.

Question 2

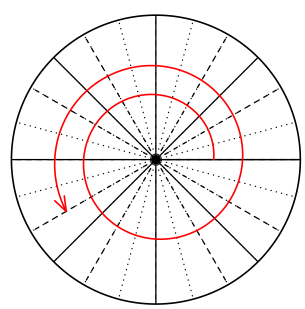
Consider angles $\frac{-15\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{-15\pi}{4}$



Find cos(−15π/4)

Mark $\frac{19\pi}{6}$



Find sin(19π/6)

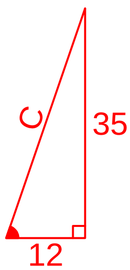
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(19\pi/6) = \frac{-1}{2}$

Question 3

If $\tan(\theta) = \frac{-35}{12}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

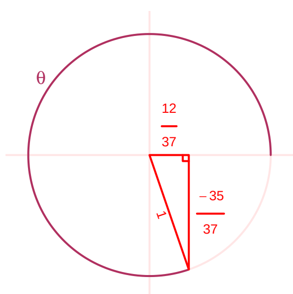
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + 35^2 = C^2$$
$$C = \sqrt{12^2 + 35^2}$$
$$C = 37$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{12}{37}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 3.87$ meters, an amplitude of 5.88 meters, and a frequency of 8.1 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.88\cos(2\pi 8.1t) + 3.87$$

or

$$y = -5.88\cos(16.2\pi t) + 3.87$$

or

$$y = -5.88\cos(50.89t) + 3.87$$

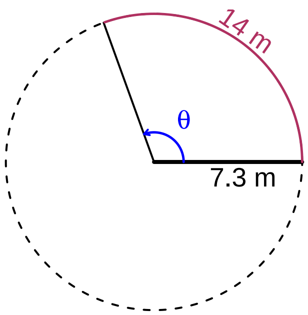
Name: Date:

Trig Final (Solution v34)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 14 meters. The radius is 7.3 meters. What is the angle measure in radians?



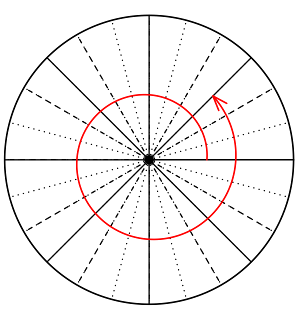
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 1.918$ radians.

Question 2

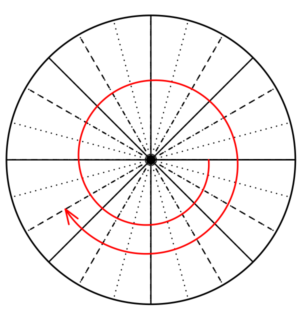
Consider angles $\frac{9\pi}{4}$ and $\frac{-17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{9\pi}{4}\right)$ and $\cos\left(\frac{-17\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{9\pi}{4}$



Find sin(9π/4)

Mark $\frac{-17\pi}{6}$



Find cos(−17π/6)

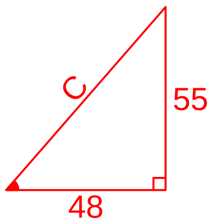
$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{-55}{48}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

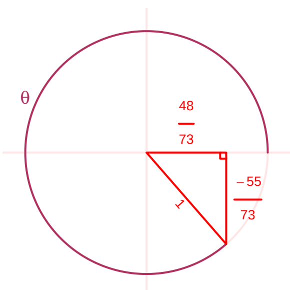
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + 55^2 = C^2$$
$$C = \sqrt{48^2 + 55^2}$$
$$C = 73$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{48}{73}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.96 meters, a midline at $y = -8.51$ meters, and a frequency of 4 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.96\cos(2\pi 4t) - 8.51$$

or

$$y = 5.96\cos(8\pi t) - 8.51$$

or

$$y = 5.96\cos(25.13t) - 8.51$$

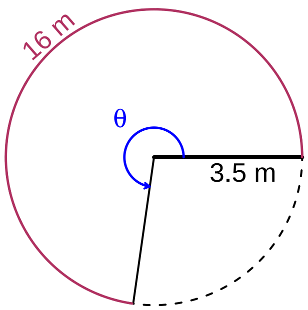
Name: Date:

Trig Final (Solution v35)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 16 meters. The radius is 3.5 meters. What is the angle measure in radians?



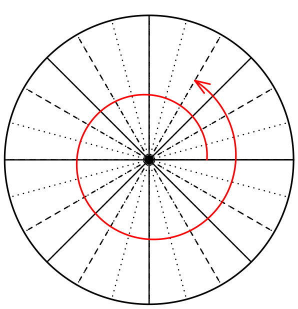
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.571$ radians.

Question 2

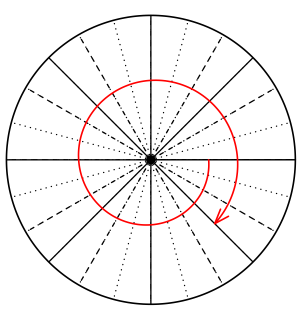
Consider angles $\frac{7\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{7\pi}{3}\right)$ and $\sin\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{7\pi}{3}$



Find cos(7π/3)

Mark $\frac{-9\pi}{4}$



Find sin(−9π/4)

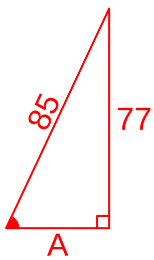
$\cos(7\pi/3) = \frac{1}{2}$

$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{77}{85}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

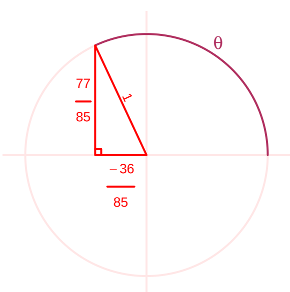
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 77^2 = 85^2$$
$$A = \sqrt{85^2 - 77^2}$$
$$A = 36$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-36}{85}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.8 meters, a midline at $y = 3.64$ meters, and a frequency of 8.28 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.8\sin(2\pi 8.28t) + 3.64$$

or

$$y = -6.8\sin(16.56\pi t) + 3.64$$

or

$$y = -6.8\sin(52.02t) + 3.64$$

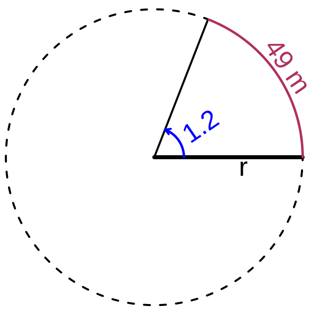
Name: Date:

Trig Final (Solution v36)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.2 radians. The arc length is 49 meters. How long is the radius in meters?

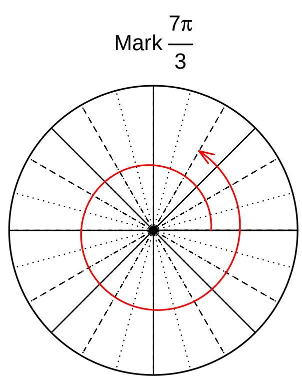


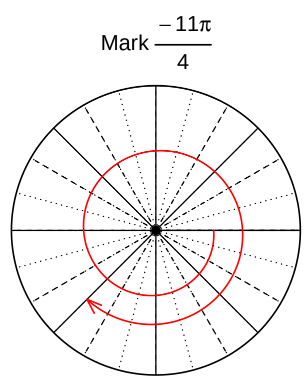
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 40.83$ meters.

Question 2

Consider angles $\frac{7\pi}{3}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{7\pi}{3}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).





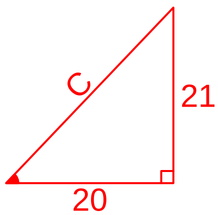
$\sin(7\pi/3) = \frac{\sqrt{3}}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{21}{20}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

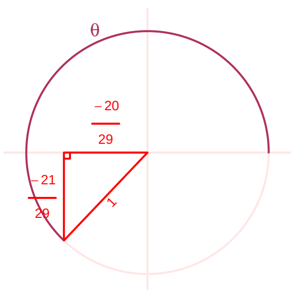
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + 21^2 = C^2$$
$$C = \sqrt{20^2 + 21^2}$$
$$C = 29$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-20}{29}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.38 Hz, an amplitude of 8.44 meters, and a midline at $y = 5.06$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.44 \sin(2\pi 3.38t) + 5.06$$

or

$$y = 8.44 \sin(6.76\pi t) + 5.06$$

or

$$y = 8.44 \sin(21.24t) + 5.06$$

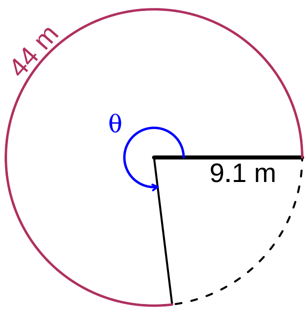
Name: Date:

Trig Final (Solution v37)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 9.1 meters. The arc length is 44 meters. What is the angle measure in radians?

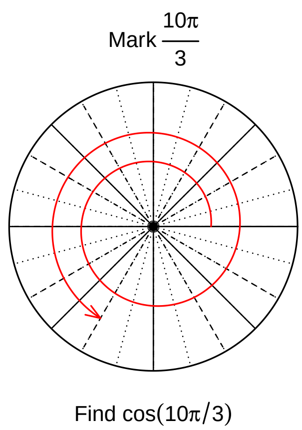


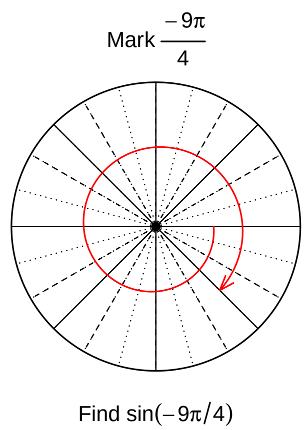
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.835$ radians.

Question 2

Consider angles $\frac{10\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{10\pi}{3}\right)$ and $\sin\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).





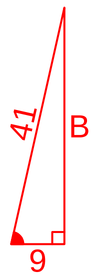
$\cos(10\pi/3) = \frac{-1}{2}$

$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-9}{41}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

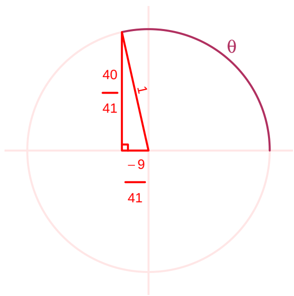
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + B^2 = 41^2$$
$$B = \sqrt{41^2 - 9^2}$$
$$B = 40$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{40}{41}}{\frac{-9}{41}} = \frac{-40}{9}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -7.28$ meters, a frequency of 3.07 Hz, and an amplitude of 4.16 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.16\sin(2\pi 3.07t) - 7.28$$

or

$$y = 4.16\sin(6.14\pi t) - 7.28$$

or

$$y = 4.16\sin(19.29t) - 7.28$$

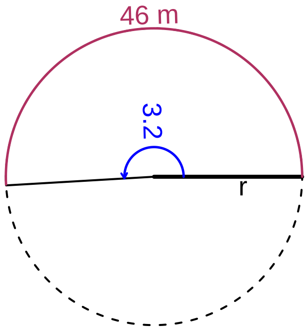
Name: Date:

Trig Final (Solution v38)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 46 meters. The angle measure is 3.2 radians. How long is the radius in meters?

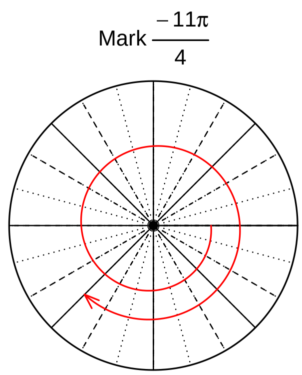


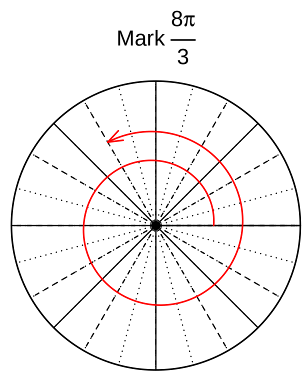
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 14.38$ meters.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).





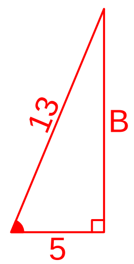
$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(8\pi/3) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{5}{13}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

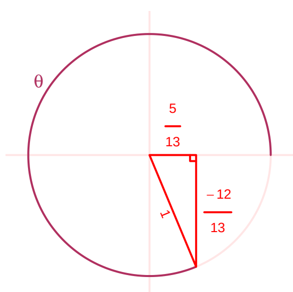
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$5^2 + B^2 = 13^2$$
$$B = \sqrt{13^2 - 5^2}$$
$$B = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-12}{13}}{\frac{5}{13}} = \frac{-12}{5}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 3.33 Hz, an amplitude of 7.18 meters, and a midline at $y = -8.44$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.18\sin(2\pi 3.33t) - 8.44$$

or

$$y = 7.18\sin(6.66\pi t) - 8.44$$

or

$$y = 7.18\sin(20.92t) - 8.44$$

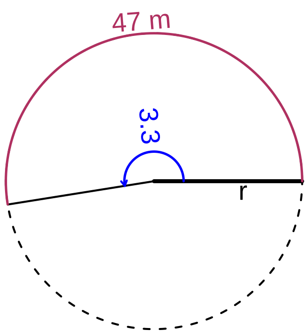
Name: Date:

Trig Final (Solution v39)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 47 meters. The angle measure is 3.3 radians. How long is the radius in meters?

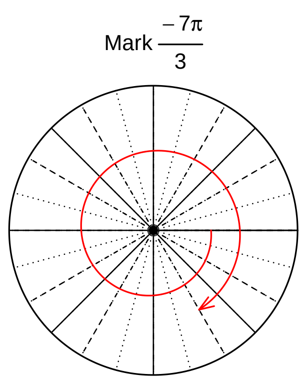


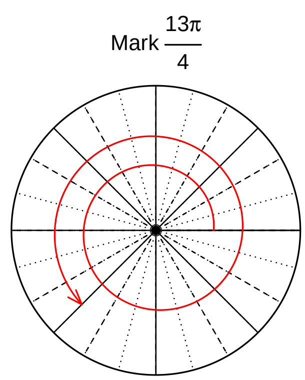
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 14.24$ meters.

Question 2

Consider angles $\frac{-7\pi}{3}$ and $\frac{13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-7\pi}{3}\right)$ and $\cos\left(\frac{13\pi}{4}\right)$ by using a unit circle (provided separately).





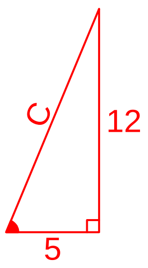
$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-12}{5}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

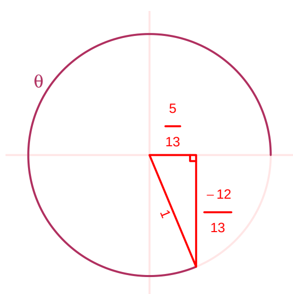
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$5^2 + 12^2 = C^2$$
$$C = \sqrt{5^2 + 12^2}$$
$$C = 13$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{5}{13}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.62 meters, a midline at $y = -8.33$ meters, and a frequency of 7.05 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.62\cos(2\pi 7.05t) - 8.33$$

or

$$y = -5.62\cos(14.1\pi t) - 8.33$$

or

$$y = -5.62\cos(44.3t) - 8.33$$

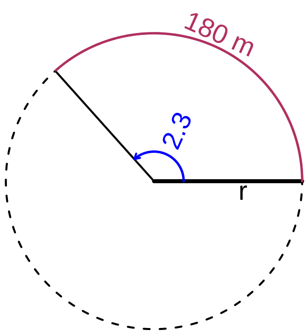
Name: Date:

Trig Final (Solution v40)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.3 radians. The arc length is 180 meters. How long is the radius in meters?



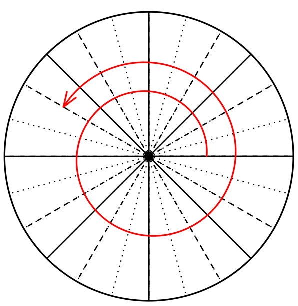
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$r = 78.26$ meters.

Question 2

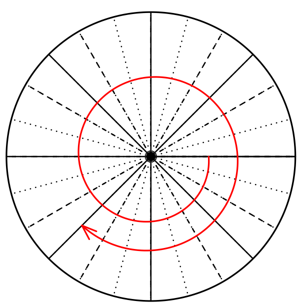
Consider angles $\frac{17\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{17\pi}{6}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{17\pi}{6}$



Find $\sin(17\pi/6)$

Mark $\frac{-11\pi}{4}$



Find $\cos(-11\pi/4)$

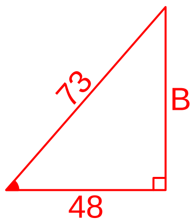
$\sin(17\pi/6) = \frac{1}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-48}{73}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

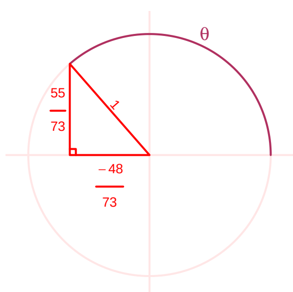
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + B^2 = 73^2$$
$$B = \sqrt{73^2 - 48^2}$$
$$B = 55$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{55}{73}}{\frac{-48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.76 Hz, an amplitude of 5.86 meters, and a midline at $y = -6.93$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.86 \sin(2\pi 8.76t) - 6.93$$

or

$$y = 5.86 \sin(17.52\pi t) - 6.93$$

or

$$y = 5.86 \sin(55.04t) - 6.93$$

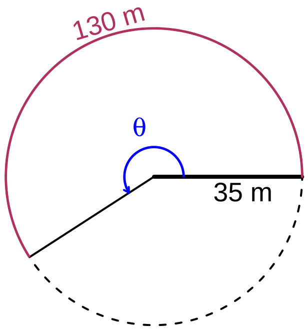
Name: Date:

Trig Final (Solution v41)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 35 meters. The arc length is 130 meters. What is the angle measure in radians?

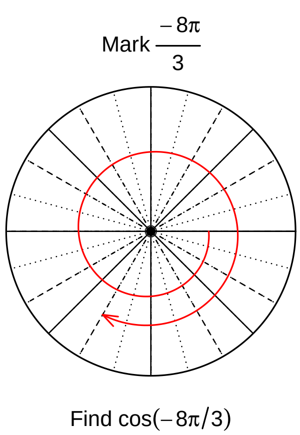


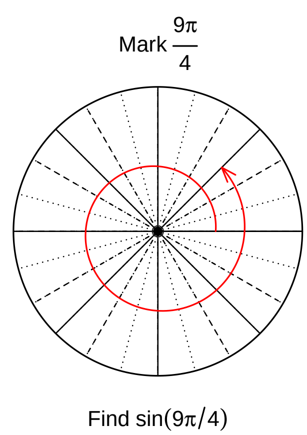
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 3.714$ radians.

Question 2

Consider angles $\frac{-8\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-8\pi}{3}\right)$ and $\sin\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).





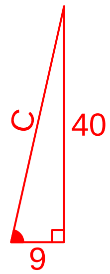
$\cos(-8\pi/3) = \frac{-1}{2}$

$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{40}{9}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

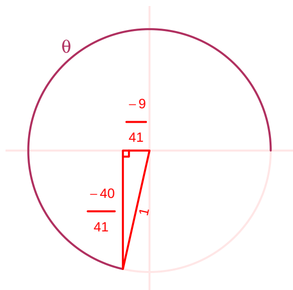
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$9^2 + 40^2 = C^2$$
$$C = \sqrt{9^2 + 40^2}$$
$$C = 41$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-9}{41}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.47 meters, a midline at $y = 8.94$ meters, and a frequency of 3.18 Hz. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.47\cos(2\pi 3.18t) + 8.94$$

or

$$y = 5.47\cos(6.36\pi t) + 8.94$$

or

$$y = 5.47\cos(19.98t) + 8.94$$

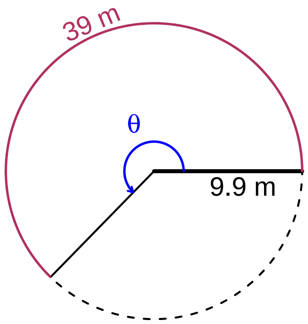
Name: Date:

Trig Final (Solution v42)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 39 meters. The radius is 9.9 meters. What is the angle measure in radians?



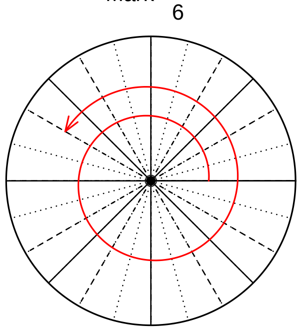
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 3.939$ radians.

Question 2

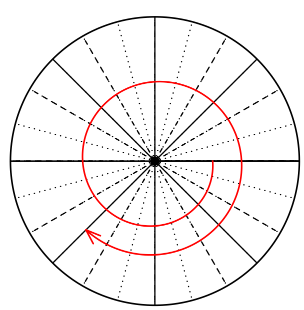
Consider angles $\frac{17\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{17\pi}{6}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{17\pi}{6}$



Find sin(17π/6)

Mark $\frac{-11\pi}{4}$



Find cos(−11π/4)

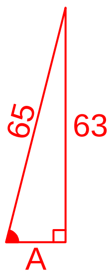
$\sin(17\pi/6) = \frac{1}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-63}{65}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

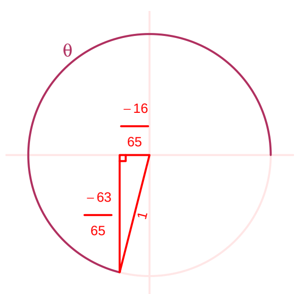
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 63^2 = 65^2$$
$$A = \sqrt{65^2 - 63^2}$$
$$A = 16$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-16}{65}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.37 Hz, a midline at $y = -2.87$ meters, and an amplitude of 6.56 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 6.56\sin(2\pi 4.37t) - 2.87$$

or

$$y = 6.56\sin(8.74\pi t) - 2.87$$

or

$$y = 6.56\sin(27.46t) - 2.87$$

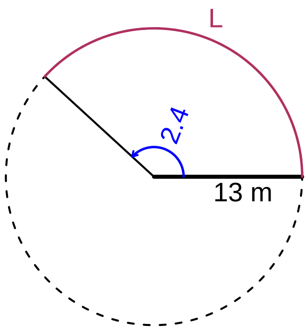
Name: Date:

Trig Final (Solution v43)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 13 meters. The angle measure is 2.4 radians. How long is the arc in meters?



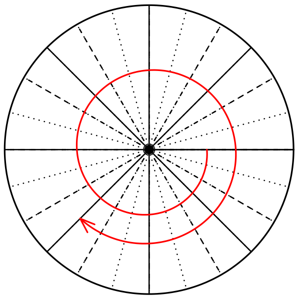
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 31.2$ meters.

Question 2

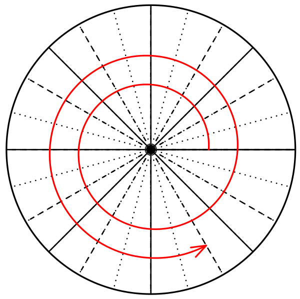
Consider angles $\frac{-11\pi}{4}$ and $\frac{11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{11\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{-11\pi}{4}$



Find $\cos(-11\pi/4)$

Mark $\frac{11\pi}{3}$



Find $\sin(11\pi/3)$

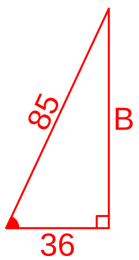
$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(11\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{36}{85}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

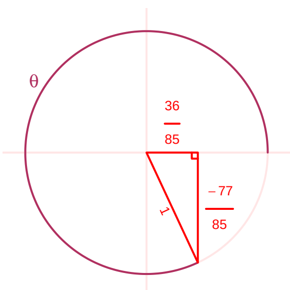
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-77}{85}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.13$ meters, an amplitude of 2.25 meters, and a frequency of 4.55 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.25\sin(2\pi 4.55t) + 7.13$$

or

$$y = 2.25\sin(9.1\pi t) + 7.13$$

or

$$y = 2.25\sin(28.59t) + 7.13$$

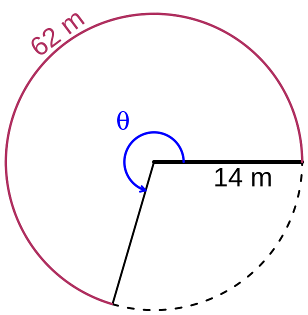
Name: Date:

Trig Final (Solution v44)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 14 meters. The arc length is 62 meters. What is the angle measure in radians?

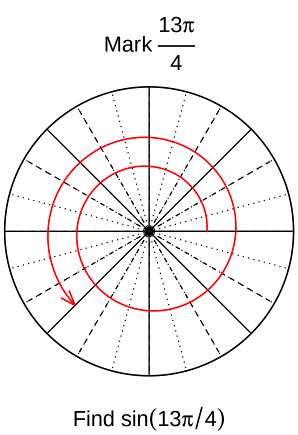


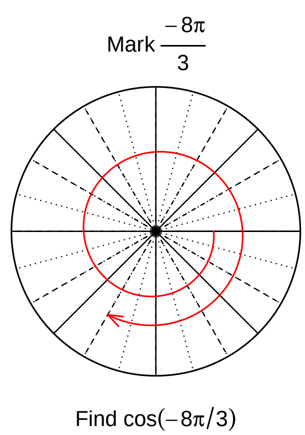
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 4.429$ radians.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-8\pi}{3}\right)$ by using a unit circle (provided separately).





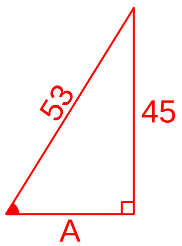
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-8\pi/3) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{45}{53}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

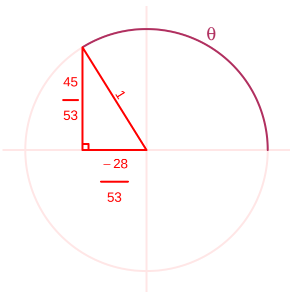
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 45^2 = 53^2$$
$$A = \sqrt{53^2 - 45^2}$$
$$A = 28$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{45}{53}}{\frac{-28}{53}} = \frac{-45}{28}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.57 Hz, an amplitude of 7.32 meters, and a midline at $y = -3.33$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 7.32 \sin(2\pi 8.57t) - 3.33$$

or

$$y = 7.32 \sin(17.14\pi t) - 3.33$$

or

$$y = 7.32 \sin(53.85t) - 3.33$$

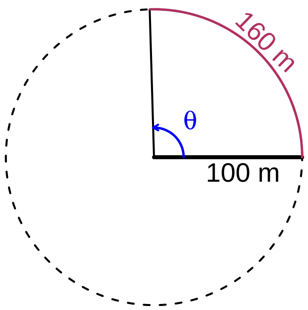
Name: Date:

Trig Final (Solution v45)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 100 meters. The arc length is 160 meters. What is the angle measure in radians?

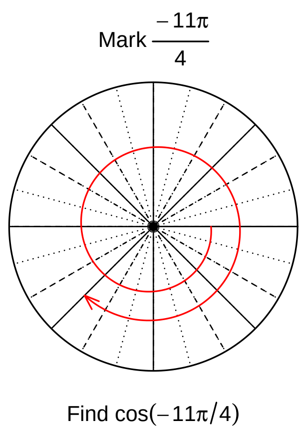


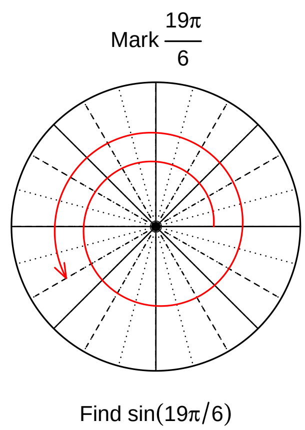
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 1.6$ radians.

Question 2

Consider angles $\frac{-11\pi}{4}$ and $\frac{19\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-11\pi}{4}\right)$ and $\sin\left(\frac{19\pi}{6}\right)$ by using a unit circle (provided separately).





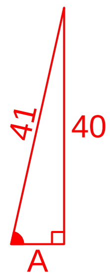
$\cos(-11\pi/4)= \frac{-\sqrt{2}}{2}$

$\sin(19\pi/6)= \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{-40}{41}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

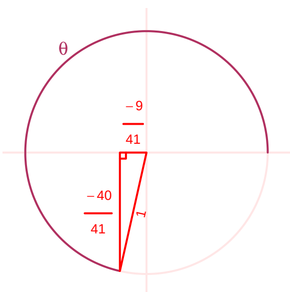
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 40^2 = 41^2$$
$$A = \sqrt{41^2 - 40^2}$$
$$A = 9$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-40}{41}}{\frac{-9}{41}} = \frac{40}{9}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 5.42$ meters, a frequency of 3.13 Hz, and an amplitude of 8.7 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.7\sin(2\pi 3.13t) + 5.42$$

or

$$y = 8.7\sin(6.26\pi t) + 5.42$$

or

$$y = 8.7\sin(19.67t) + 5.42$$

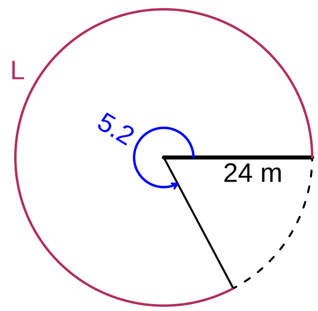
Name: Date:

Trig Final (Solution v46)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 24 meters. The angle measure is 5.2 radians. How long is the arc in meters?



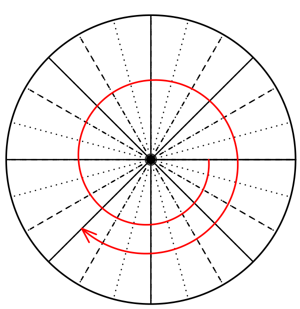
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 124.8$ meters.

Question 2

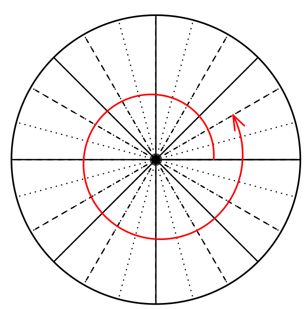
Consider angles $\frac{-11\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-11\pi}{4}\right)$ and $\cos\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{-11\pi}{4}$



Find sin(−11π/4)

Mark $\frac{13\pi}{6}$



Find cos(13π/6)

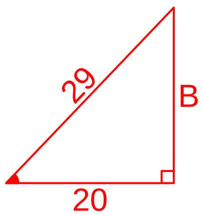
$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-20}{29}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

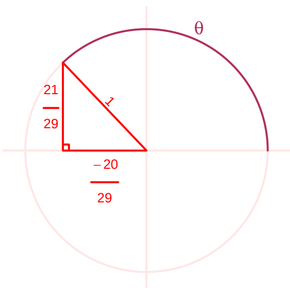
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + B^2 = 29^2$$
$$B = \sqrt{29^2 - 20^2}$$
$$B = 21$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{21}{29}}{\frac{-20}{29}} = \frac{-21}{20}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 4.47 Hz, a midline at $y = -2.96$ meters, and an amplitude of 8.66 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.66\sin(2\pi 4.47t) - 2.96$$

or

$$y = -8.66\sin(8.94\pi t) - 2.96$$

or

$$y = -8.66\sin(28.09t) - 2.96$$

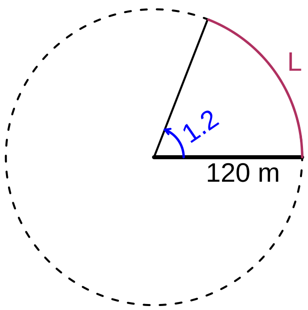
Name: Date:

Trig Final (Solution v47)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.2 radians. The radius is 120 meters. How long is the arc in meters?



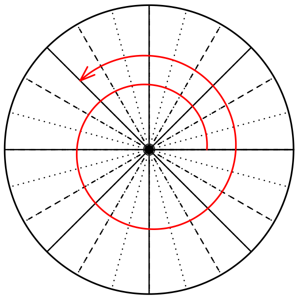
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 144$ meters.

Question 2

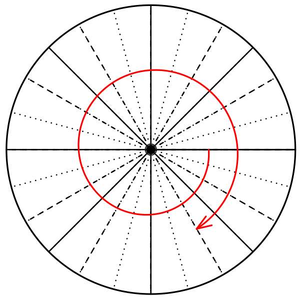
Consider angles $\frac{11\pi}{4}$ and $\frac{-7\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{11\pi}{4}\right)$ and $\sin\left(\frac{-7\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{11\pi}{4}$



Find $\cos(11\pi/4)$

Mark $\frac{-7\pi}{3}$



Find $\sin(-7\pi/3)$

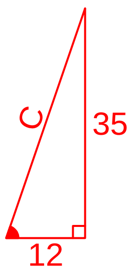
$\cos(11\pi/4) = \frac{-\sqrt{2}}{2}$

$\sin(-7\pi/3) = \frac{-\sqrt{3}}{2}$

Question 3

If $\tan(\theta) = \frac{35}{12}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.

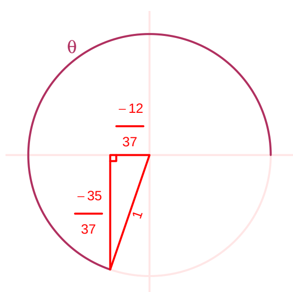
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + 35^2 = C^2$$
$$C = \sqrt{12^2 + 35^2}$$
$$C = 37$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\cos(\theta) = \frac{-12}{37}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.12$ meters, an amplitude of 8.99 meters, and a frequency of 4.48 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.99\cos(2\pi 4.48t) + 7.12$$

or

$$y = -8.99\cos(8.96\pi t) + 7.12$$

or

$$y = -8.99\cos(28.15t) + 7.12$$

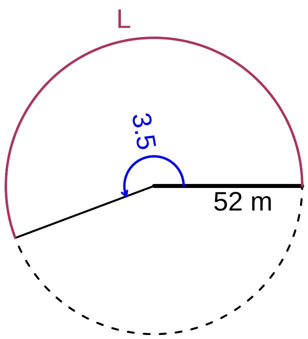
Name: Date:

Trig Final (Solution v48)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 3.5 radians. The radius is 52 meters. How long is the arc in meters?



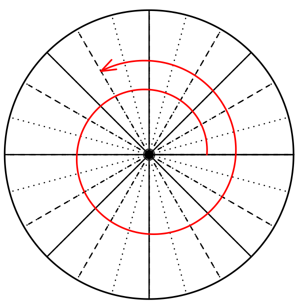
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 182$ meters.

Question 2

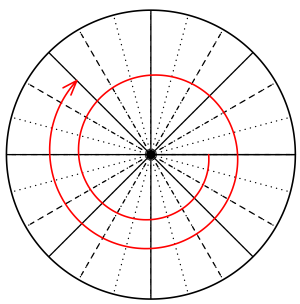
Consider angles $\frac{8\pi}{3}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{8\pi}{3}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\frac{8\pi}{3}$



Find $\cos(8\pi/3)$

Mark $\frac{-13\pi}{4}$



Find $\sin(-13\pi/4)$

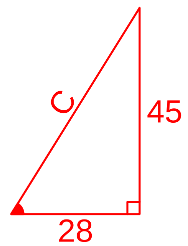
$\cos(8\pi/3) = \frac{-1}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-45}{28}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

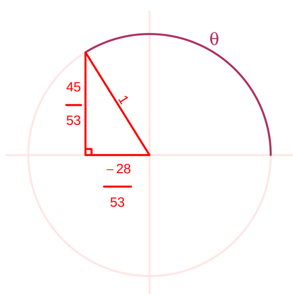
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + 45^2 = C^2$$
$$C = \sqrt{28^2 + 45^2}$$
$$C = 53$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-28}{53}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.41$ meters, an amplitude of 4.4 meters, and a frequency of 3.05 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.4\sin(2\pi 3.05t) - 5.41$$

or

$$y = -4.4\sin(6.1\pi t) - 5.41$$

or

$$y = -4.4\sin(19.16t) - 5.41$$

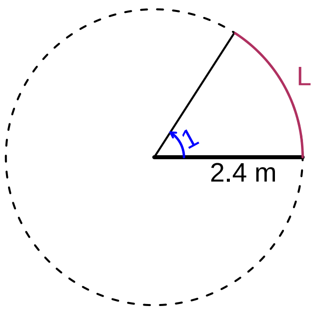
Name: Date:

Trig Final (Solution v49)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1 radians. The radius is 2.4 meters. How long is the arc in meters?



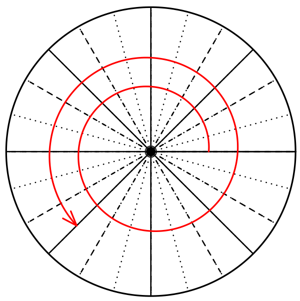
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$L = 2.4$ meters.

Question 2

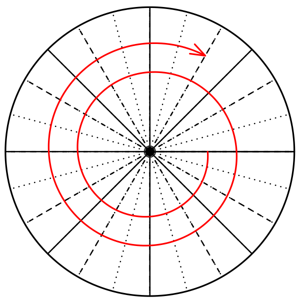
Consider angles $\frac{13\pi}{4}$ and $\frac{-11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-11\pi}{3}\right)$ by using a unit circle (provided separately).

Mark $\frac{13\pi}{4}$



Find $\sin(13\pi/4)$

Mark $\frac{-11\pi}{3}$



Find $\cos(-11\pi/3)$

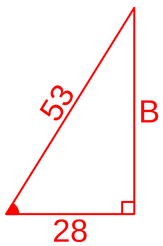
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-11\pi/3) = \frac{1}{2}$

Question 3

If $\cos(\theta) = \frac{28}{53}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

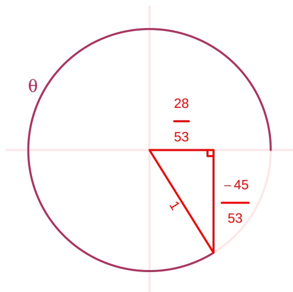
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$28^2 + B^2 = 53^2$$
$$B = \sqrt{53^2 - 28^2}$$
$$B = 45$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-45}{53}}{\frac{28}{53}} = \frac{-45}{28}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -4.26$ meters, a frequency of 6.98 Hz, and an amplitude of 8.56 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.56\sin(2\pi 6.98t) - 4.26$$

or

$$y = -8.56\sin(13.96\pi t) - 4.26$$

or

$$y = -8.56\sin(43.86t) - 4.26$$

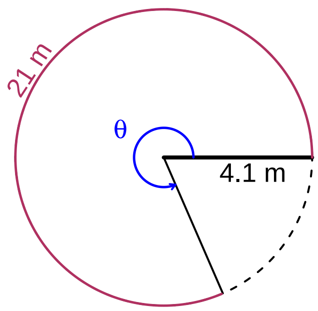
Name: Date:

Trig Final (Solution v50)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 21 meters. The radius is 4.1 meters. What is the angle measure in radians?



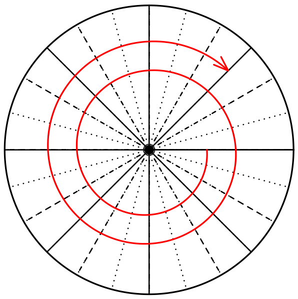
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

$\theta = 5.122$ radians.

Question 2

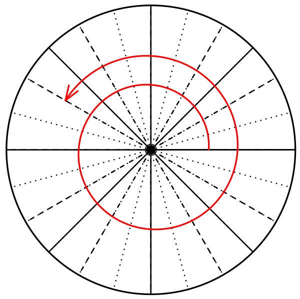
Consider angles $\frac{-15\pi}{4}$ and $\frac{17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-15\pi}{4}\right)$ and $\sin\left(\frac{17\pi}{6}\right)$ by using a unit circle (provided separately).

Mark $\frac{-15\pi}{4}$



Find $\cos(-15\pi/4)$

Mark $\frac{17\pi}{6}$



Find $\sin(17\pi/6)$

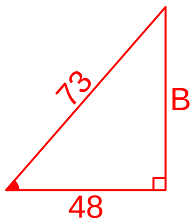
$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(17\pi/6) = \frac{1}{2}$

Question 3

If $\cos(\theta) = \frac{48}{73}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

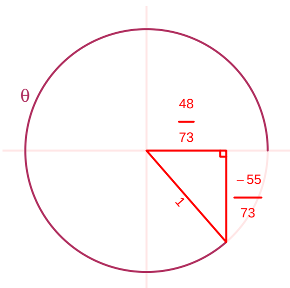
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + B^2 = 73^2$$
$$B = \sqrt{73^2 - 48^2}$$
$$B = 55$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-55}{73}}{\frac{48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.57 Hz, a midline at $y = 5.45$ meters, and an amplitude of 3.15 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.15\sin(2\pi 8.57t) + 5.45$$

or

$$y = 3.15\sin(17.14\pi t) + 5.45$$

or

$$y = 3.15\sin(53.85t) + 5.45$$